Professional Manpower Bulletin

Professional Manpower Bulletin

Economics and Research Branch, Department of Labour, Canada

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THE 1962 SURVEY OF EMPLOYMENT AND REQUIREMENTS FOR ENGINEERING AND SCIENTIFIC MANPOWER

The Department of Labour has just completed the eighth in a series of biennial surveys of employers of engineering and scientific manpower in Canada. Close to 2,800 establishments in the three major employment sectors of industry, university, and government were covered in the survey. Sixty-five per cent of those replying to the survey indicated that they employed engineers and scientists. The returns included information on 30,750 engineers, 13,650 natural scientists, and 1,650 social scientists in the fields of economics, sociology and statistics.

The survey covered such subjects as the employment distribution of engineers and scientists according to their field of specialization, the extent of shortages measured through the number of positions reported as being vacant, short-term and five-year estimates of future requirements for engineers and scientists, the types of functions in which they are engaged and some aspects of the rate of their employment turnover.

This release through the Professional Manpower Bulletin series is preliminary to the publication of a full report on the findings of the survey which will appear in the Professional Manpower Report series. See box notice on this page.

HIGHLIGHTS

Employment Distribution: The survey reveals that in the case of engineering manpower (Table 2A), industry is by far the largest employer with close to 80 per cent reported in this sector. Colleges and universities employ only 3 per cent and government agencies, 18 per cent. The employment distribution of natural scientists (see Table 2B) indicates a contrasting pattern to that of the engineers. Here, the government sector is the major employer, absorbing 48 per cent; industry is second with 30 per cent. The proportion employed by colleges and universities is 14 per cent.

Vacancies: Twenty-seven per cent of all establishments responding to the survey and employing engineers or scientists reported vacant engineering or scientific positions (Table 3). Of establishments employing engineers, vacancies amounted to 6

— NOTICE —

The Professional Manpower Bulletin series, of which this issue is the first, will serve as a means to co-ordinate and standardize all short releases of information on matters concerning professional manpower. The more comprehensive documents, which up to the present have been known as Professional Manpower Bulletins, will in the future be released under the title of Professional Manpower Report.

per cent of the total number of established engineering positions. The vacancy rate in establishments employing natural scientists was also 6 per cent, while establishments employing social scientists reported the somewhat higher proportion of vacancies of 10 per cent. In the industrial and metallurgical fields of engineering, the number of positions reported as being vacant were considerably higher than the 6 per cent rate for engineering as a whole, while the fields of aeronautical and mining engineering showed less than proportionate rates of vacancies. Comparative analyses of the individual fields in natural science show that the vacancies were highest in the field of mathematics and lowest in the fields of agriculture, forestry and geology.

Estimates of Future Requirements for professional personnel by employers of engineers and scientists indicate the continuance of a fairly stable growth pattern (Tables 4 and 5). In the previous survey (1960), employers estimated an annual average increase in the demand for engineers for a three-year period of 5.5 per cent. The annual average estimate of increase derived from the current survey for a short-term period of two years to 1964 is 6 per cent. In the case of natural scientists the previous survey showed an expected average rise of 4.6 per cent annually for the three years and the 1962 survey shows an expected rise of 5 per cent annually over the two-year period. The anticipated average increase in requirements for social scientists, in the three fields of economics, sociology and statistics, is somewhat higher at 9 per cent annually.

Considering individual fields, the greatest increase in requirements for engineers is expected in the field of industrial engineering (11 per cent annual average), while in the fields geological, metallurgical and mining less than proportionate annual gains are anticipated (3 per cent annual average). In the fields of natural science, estimates of requirements are highest in the field of mathematics (11 per cent annual average), and lowest in the fields of agriculture, forestry and geology (3 per cent annual average). In the social science fields of economics, statistics and sociology, estimates of annual increases between 1962 and 1964 are 8, 10 and 13 per cent respectively.

SURVEY COVERAGE

The mailing list for this survey included all industrial establishments or organizations employing more than 100 workers in the following employment fields: mining and quarrying; transportation and communication; public utilities; and finance and insurance. In the case of the employment field of professional business service a more comprehensive coverage was made because of the heavy concentration of professional personnel in this sector. In the construction industry, only firms with 200 or more employees were included. The list did not include establishments in some specific industries which do not employ these types of professionals in significant numbers. These exceptions were clothing, printing and publishing, and hospitals. Crown corporations have been included in the industrial sector. The government sector covered all federal departments and agencies, all provincial government departments and major municipal governments. Colleges and universities included all the major degree-granting educational institutions. The mailing list in the industrial sector was similar to that used by the Dominion Bureau of Statistics for their survey of Industrial Research Development Expenditures in Canada.

In this current survey the coverage of professional fields has been expanded to include the three social science fields of economics, sociology and statistics. In future surveys the coverage will be further expanded so as to include all the major fields in the social science group.

Table 1

1962 Survey Coverage

Number of Establishments on Mailing List, with Percentage of Response, and Percentage Employing Engineers and Scientists by Employment Sector

Employment Sector	Establishments on Mailing List	Establishments Responding	Percentage Response	Establishments Responding Which Employ Engineers and Scientists	Establishments Employing Engineers and Scientists as a Percentage of Those Responding
	(Number)	(Number)	(%)	(Number)	(%)
Total all sectors	2,779	2,495	89.8	1,617	64.8
Total industry	2,519	2,258	89.6	1,415	62.7
Mining and quarrying	197	190	96.4	146	76.8
Manufacturing	1,462	1,358	92.9	807	59.4
Construction	303	261	86.1	163	62.5
Transportation, communication	155	139	89.7	54	38.8
Public utilities	70	57	81.4	50	87.7
Finance, insurance	28	27	96.4	20	74.1
Professional service	304	226	74.3	175	77.4
Colleges and universities	34	30	88.2	30	100.0
Total government agencies	226	207	91.6	172	83.1
Federal government	38	38	100.0	36	94.7
Municipal government	52	47	90.4	45	95.7
Provincial government	136	122	89.7	91	74.6

Table 2A

Number of Persons Employed in Engineering at January 1, 1962, and their Percentage Distribution by Employment Sector and Field of Employment Specialization

Employment Sector	Total Engineering(1)	Aeronautical	Chemical and Petroleum	Civil	Electrical and Electronic	Geological	Industrial	Mechanical	Metallurgical	Mining
	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)
Total all sectors	30,746	445	4,199	7,227	7,445	676	641	7,046	943	1,067
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Total all sectors	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total industry	79.3	71.7	87.8	54.7	86.0	90.5	96.7	89.5	82.2	88.6
Mining and quarrying	6.9	-	10.6	2.2	1.4	51.3	3.9	2.1	22.2	56.4
Manufacturing	45.2	63.4	70.5	12.9	37.2	33.3	70.5	72.3	50.6	27.7
Construction	3.5	*	0.8	10.2	1.3	0.7	1.7	1.7	-	1.0
Transportation, communication.	9.2	7.7	0.5	6.1	27.9	*	7.6	2.2	1.1	0.5
Public utilities	5.8	-	1.1	4.7	14.1	1.5	0.5	3.7	*	1.5
Finance, insurance	*	-	-	*	-	-	-	*	-	-
Professional service	8.7	*	4.3	18.6	4.1	3.6	12.5	7.5	7.9	1.5
Colleges and universities	3.0	10.8	1.9	3.5	2.5	3.4	*	3.0	4.8	3.2
Total government agencies	17.7	17.5	10.3	41.8	11.5	6.1	3.1	7.5	13.0	8.2
Federal government	9.3	15.3	8.6	15.0	8.6	1.9	0.8	5.7	11.2	3.4
Municipal government	2.2	-	*	7.7	1.0	*	-	*	-	-
Provincial government	6.2	2.2	1.5	19.1	1.9	3.9	2.3	1.6	1.8	4.8

(1) "Other fields of specialization" not listed here include 1,057 engineers. These are included in "Total Engineering".

Symbols:

* Less than 0.05 per cent.
- No entry in category.

Table 2B

Number of Persons Employed in the Natural and Social Sciences at January 1, 1962, and their Percentage Distribution by Employment Sector and Field of Employment Specialization

Employment Sector	Total Natural Science(1)	Agriculture	Biology	Chemistry	Forestry	Geology	Mathematics	Physics	Total Three Social Sciences	Economics	Sociology	Statistics
	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)
Total all sectors	13,644	3,153	1,621	3,632	1,216	1,042	896	1,089	1,650	1,100	224	326
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Total all sectors	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total industry	37.8	18.2	8.9	64.6	42.0	65.1	45.5	22.4	29.9	34.9	22.3	18.4
Mining and quarrying	5.0	1.0	-	2.0	*	41.6	1.2	4.0	1.5	1.8	1.3	0.6
Manufacturing	27.7	14.8	8.1	58.8	37.7	17.6	9.4	15.1	18.2	21.4	14.3	10.1
Construction	*	-	-	-	-	*	-	-	*	-	-	1.6
Transportation, communication.	0.8	1.1	*	0.6	0.5	*	1.8	1.4	4.4	4.8	4.5	3.1
Public utilities	0.6	1.0	*	*	2.2	*	*	*	0.7	0.8	*	0.6
Finance, insurance	2.1	-	-	-	-	-	31.6	-	3.4	4.7	-	1.2
Professional service	1.6	*	0.6	2.8	1.2	5.1	1.2	1.8	1.4	1.4	1.8	1.2
Colleges and universities	14.2	10.8	23.6	10.0	2.9	10.2	38.5	29.7	19.8	18.9	43.3	6.4
Total government agencies	48.0	71.0	67.5	25.4	55.1	24.7	16.0	47.9	50.3	46.2	34.4	75.2
Federal government	31.3	31.4	51.9	23.3	13.8	17.9	11.2	44.8	39.0	34.3	17.4	69.7
Municipal government	*	*	-	*	*	-	-	-	1.2	*	6.3	0.6
Provincial government	16.6	39.4	15.6	1.9	41.2	6.8	4.8	3.1	10.1	11.5	10.7	4.9

(1) "Other fields of specialization" not listed here include 995 natural scientists. These are included in "Total Natural Science".

Symbols:
* Less than 0.05 per cent.
- No entry in category.

Table 3

Percentage of Establishment Reporting Vacant Positions at January 1, 1962
and Vacancy Rate by Field of Employment Specialization

Field of Employment Specialization	Total Establishments	Percentage Reporting Vacancies	Total Positions (Employment plus Vacancies)	Percentage Vacancy
	(Number)	(%)	(Number)	(%)
Total engineering	1,514	27.3	32,785	6.2
Aeronautical	39	20.5	467	4.7
Chemical and petroleum	395	23.8	4,490	6.5
Civil	651	19.5	7,640	5.4
Electrical and electronic	542	21.2	7,976	6.7
Geological	146	13.0	716	5.6
Industrial	221	23.1	722	11.2
Mechanical	833	20.4	7,489	5.9
Metallurgical	210	16.7	1,031	8.5
Mining	200	12.0	1,118	4.6
Other	195	16.4	1,136	7.0
Total natural science	550	26.7	14,516	6.0
Agriculture	127	24.4	3,284	4.0
Biology	91	33.0	1,714	5.4
Chemical	318	23.6	3,838	5.4
Forestry	100	16.0	1,271	4.3
Geology	97	16.5	1,093	4.7
Mathematics	116	37.9	999	10.3
Physics	100	23.0	1,186	8.2
Other	83	21.7	1,131	12.0
Total social science	229	26.6	1,841	10.4
Economics	167	29.3	1,212	9.2
Sociology	68	27.9	259	13.5
Statistics	80	23.8	370	11.9

Table 4

Estimate of Future Requirements for Engineering and Scientific Manpower
by Field of Employment Specialization - Short Term and Five Years

Field of Employment Specialization	Employment Jan. 1, 1962	Vacancies Jan. 1, 1962	Total Positions (Employment plus Vacancies) Jan. 1, 1962	Estimate of Future Requirements(1)	
				Short Term	Five Years
				Annual Average Percentage Change Jan. 1, 1962 to Jan. 1, 1964	Total Percentage Change Jan. 1, 1962 to Jan. 1, 1967
	(Number)	(Number)	(Number)	(%)	(%)
Total engineering	30,746	2,039	32,785	6	32
Aeronautical	445	22	467	6	
Chemical and petroleum	4,199	291	4,490	6	
Civil	7,227	413	7,640	5	
Electrical and electronic	7,445	531	7,976	6	
Geological	676	40	716	3	
Industrial	641	81	722	11	
Mechanical	7,046	443	7,489	7	
Metallurgical	943	88	1,031	3	
Mining	1,067	51	1,118	2	
Other	1,057	79	1,136	6	
Total natural science	13,644	872	14,516	5	31
Agriculture	3,153	131	3,284	3	
Biology	1,621	93	1,714	6	
Chemistry	3,632	206	3,838	6	
Forestry	1,216	55	1,271	3	
Geology	1,042	51	1,093	4	
Mathematics	896	103	999	11	
Physics	1,089	97	1,186	6	
Other	995	136	1,131	8	
Total social science	1,650	191	1,841	9	88
Economics	1,100	112	1,212	8	
Sociology	224	35	259	13	
Statistics	326	44	370	10	

(1) All quantities are plus quantities.

Table 5

Estimate of Future Requirements for Engineering and Scientific Manpower
by Employment Sector - Short Term and Five Years

Employment Sector	Total Positions (Employment plus Vacancies) Jan. 1, 1962			Estimate of Future Requirements(1)					
				Short Term			Five Years		
				Annual Average Percentage Change Jan. 1, 1962 to Jan. 1, 1964			Total Percentage Change Jan. 1, 1962 to Jan. 1, 1967		
	Engineering	Natural Science	Social Science	Engineering	Natural Science	Social Science	Engineering	Natural Science	Social Science
	(Number)	(Number)	(Number)	(%)	(%)	(%)	(%)	(%)	(%)
Total all sectors	32,785	14,516	1,841	6	5	9	32	31	88
Total industry	25,942	5,450	563	6	5	9	32	29	77
Mining and quarrying	2,314	720	27	3	2	-	26	10	-
Manufacturing	14,790	3,964	329	7	6	11	36	34	-
Construction	1,131	2	5	12	-	-	80	-	-
Transportation, communication.	3,003	104	91	4	1	-	9	-	-
Public utilities	1,860	94	13	3	4	-	29	-	-
Finance, insurance	3	323	73	-	8	-	-	22	-
Professional service	2,841	243	25	7	6	-	-	-	-
Colleges and universities	942	2,022	342	11	9	13	49	34	107
Total government	5,901	7,044	936	5	5	8	27	32	81
Federal government	3,186	4,619	726	5	5	6	29	40	-
Municipal government	680	13	21	1		-	-	-	-
Provincial government	2,035	2,412	189	6	4	-	25	20	-

(1) All quantities are plus quantities.

Symbols:

- Totals too small for percentage computation.

Professional Manpower Bulletin

Economics and Research Branch, Department of Labour, Canada

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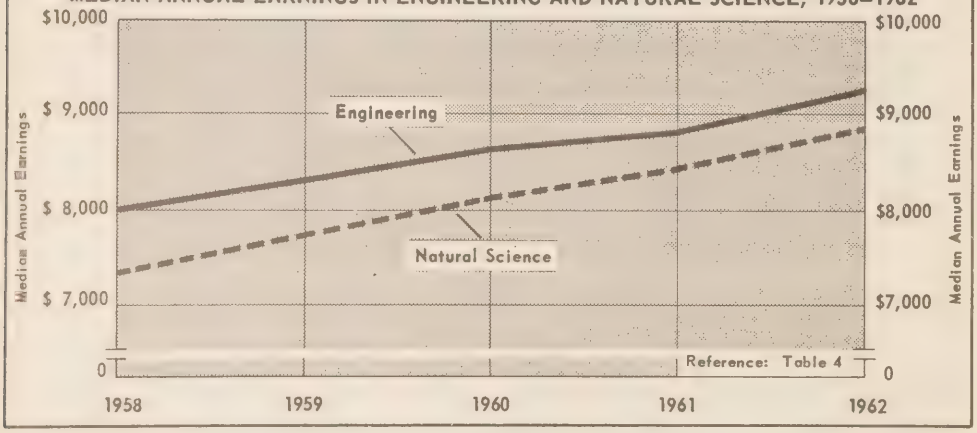
ANNUAL EARNINGS IN THE SCIENTIFIC AND TECHNICAL PROFESSIONS, 1962

A Preliminary Report

The seventh annual survey of the scientific and technical professions was carried out by the federal Department of Labour in 1963, covering a representative sample of qualified architects, engineers, scientists and veterinarians. Information on annual earnings in these professions, tabulated from replies received from over 16,000 respondents, is given below. The Department of Labour gratefully acknowledges the assistance of all those who co-operated in the survey.

Chart 1

MEDIAN ANNUAL EARNINGS IN ENGINEERING AND NATURAL SCIENCE, 1958–1962



MAIN FINDINGS

- Median annual earnings in the six major scientific and technical fields in 1962 were: architecture, $9,900; engineering, $9,200; natural science, $8,800; veterinary medicine, $8,500; forestry, $7,900; and agriculture, $7,400.
- Increases in annual earnings in 1962 were the largest recorded in the past five years, with the most substantial gains taking place in mathematics ($900); chemistry ($900); mathematics and physics ($800); and biology ($700).
- From 1958 to 1962, median annual earnings of graduates in agriculture have increased by 25 per cent; natural science, 21 per cent; veterinary medicine, 20 per cent; forestry, 18 per cent; engineering, 15 per cent; and architecture, 13 per cent.
- By minor field, median earnings in 1962 were highest for graduates in mining engineering and mathematics and physics at $10,100, followed by metallurgical engineering, $10,000, and geology, $9,900.
- Earnings in engineering and science in 1962 ranged from over $5,000 for new graduates to $10,000-$12,000 for those with twenty years or more experience.

Table 1

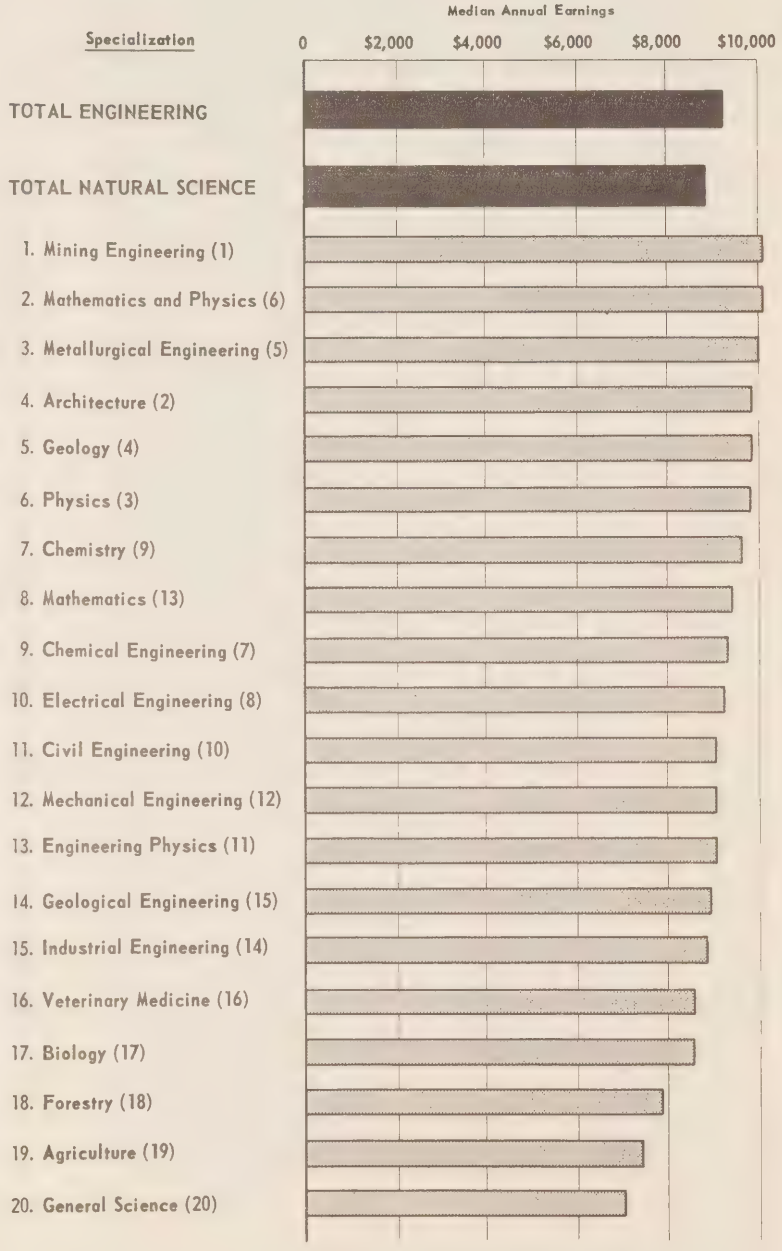
Median Annual Earnings in the Scientific and Technical Professions, 1961-1962
All Specializations[1]

Specialization	1962		1961		Increase 1962/1961	
	Replies	Median	Replies	Median		
	No.	$	No.	$	$	%
Agriculture	1,566	7,400	1,425	6,800	600	8.8
Architecture	455	9,900	361	9,500	400	4.2
Engineering						
Chemical	1,206	9,300	1,115	8,900	400	4.5
Civil	2,721	9,000	2,505	8,600	400	4.7
Electrical	2,176	9,200	2,120	8,900	300	3.4
Engineering Physics	186	9,000	146	8,600	400	4.7
Geological	147	8,900	122	8,300	600	7.2
Industrial	158	8,800	142	8,400	400	4.8
Mechanical	2,221	9,000	2,214	8,600	400	4.7
Metallurgical	282	10,000	252	9,400	600	6.4
Mining	543	10,100	527	9,800	300	3.1
Other	292	9,200	299	8,500	700	8.2
Total	9,932	9,200	9,442	8,800	400	4.5
Forestry	665	7,900	589	7,600	300	3.9
Natural Science						
Biology	329	8,500	304	7,800	700	9.0
Chemistry	893	9,600	879	8,700	900	10.3
General	761	7,000	568	6,600	400	6.1
Geology	339	9,900	403	9,400	500	5.3
Mathematics	143	9,400	156	8,500	900	10.6
Mathematics and Physics	231	10,100	237	9,300	800	8.6
Physics	252	9,800	260	9,500	300	3.2
Other	300	9,000	307	8,700	300	3.4
Total	3,248	8,800	3,114	8,400	400	4.8
Veterinary Medicine	389	8,500	321	8,000	500	6.3
Total, All Specializations	16,255	8,800	15,252	8,500	300	3.5

(1) Respondents were classified into specializations on the basis of field of study for their highest university degree, or field of employment in the case of non-graduates. For the purposes of this report, "agriculture" and "forestry" are not included under the heading "natural science".

Chart 2

MEDIAN ANNUAL EARNINGS IN THE SCIENTIFIC AND TECHNICAL PROFESSIONS, 1962
ACCORDING TO RANK*



* 1961 position given in brackets after each specialization

Table 2

Median Annual Earnings by Years from Bachelor Graduation,[1] 1962
Engineering and Natural Science

Respondents who were working for an employer (self-employed excluded)

Years from Bachelor Graduation	Engineering		Natural Science	
	Replies	Median	Replies	Median
	No.	$	No.	$
0[2]	-	5,200	-	5,100
1	471	5,700	120	5,400
2	420	6,300	110	5,500
3	403	6,600	98	5,800
4	426	6,900	99	6,300
5	363	7,500	102	7,000
6	373	7,800	96	7,200
7	314	8,100	97	7,400
8	299	8,500	103	7,600
9	298	8,700	110	8,200
10	361	8,800	117	8,400
1 - 5	2,083	6,500	529	5,900
6 - 10	1,645	8,400	523	7,700
11 - 15	2,593	9,700	864	9,100
16 - 20	883	10,700	354	10,400
21 - 25	701	11,600	332	10,900
26 - 30	655	11,400	266	10,800
31 - 35	396	11,700	179	11,800
36 - 40	250	12,500	90	11,700
Over 40	64	(3)	19	(3)
Total, All Years	9,270	9,000	3,156	8,800

(1) The equivalent year is used in the case of non-graduates.
(2) Starting salaries for 1962 bachelor's level graduates.
(3) Number of respondents too small to compute medians.

Chart 3

MEDIAN ANNUAL EARNINGS BY YEARS FROM BACHELOR GRADUATION, 1962 ENGINEERING AND NATURAL SCIENCE

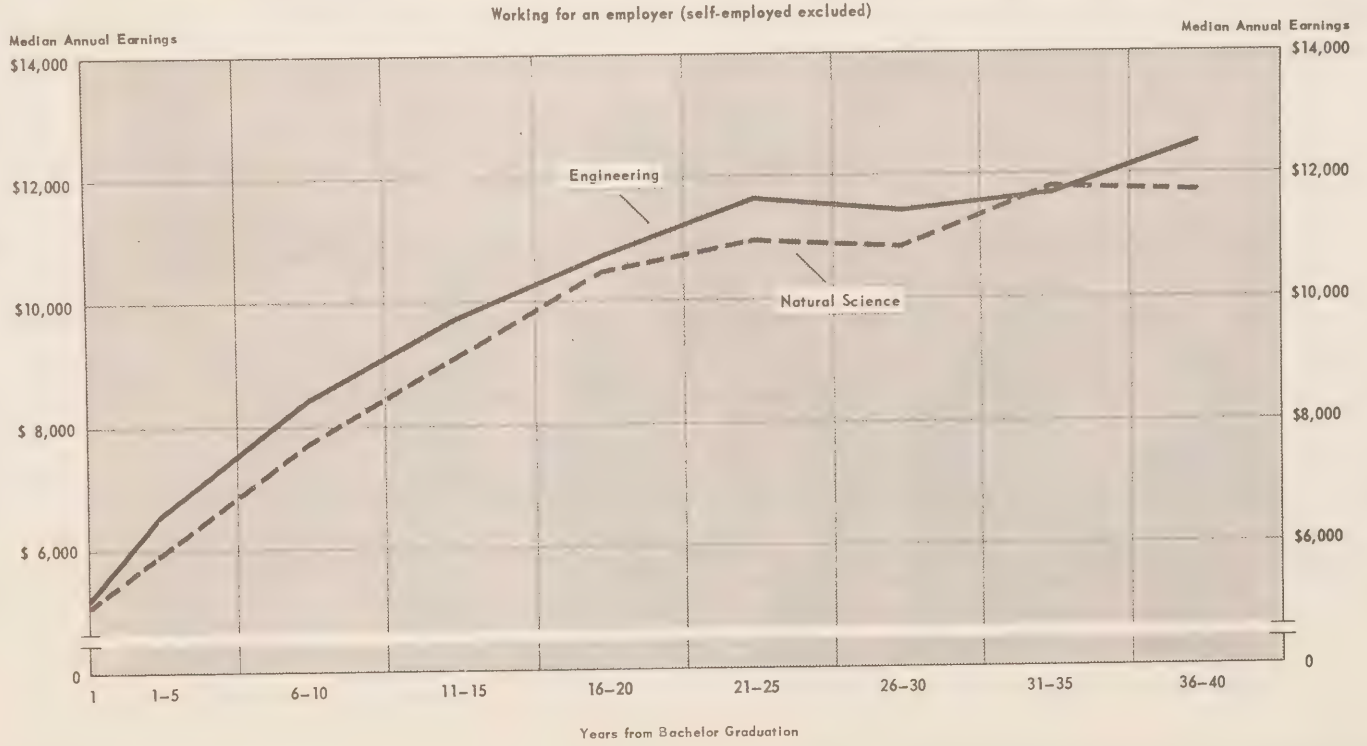


Table 3

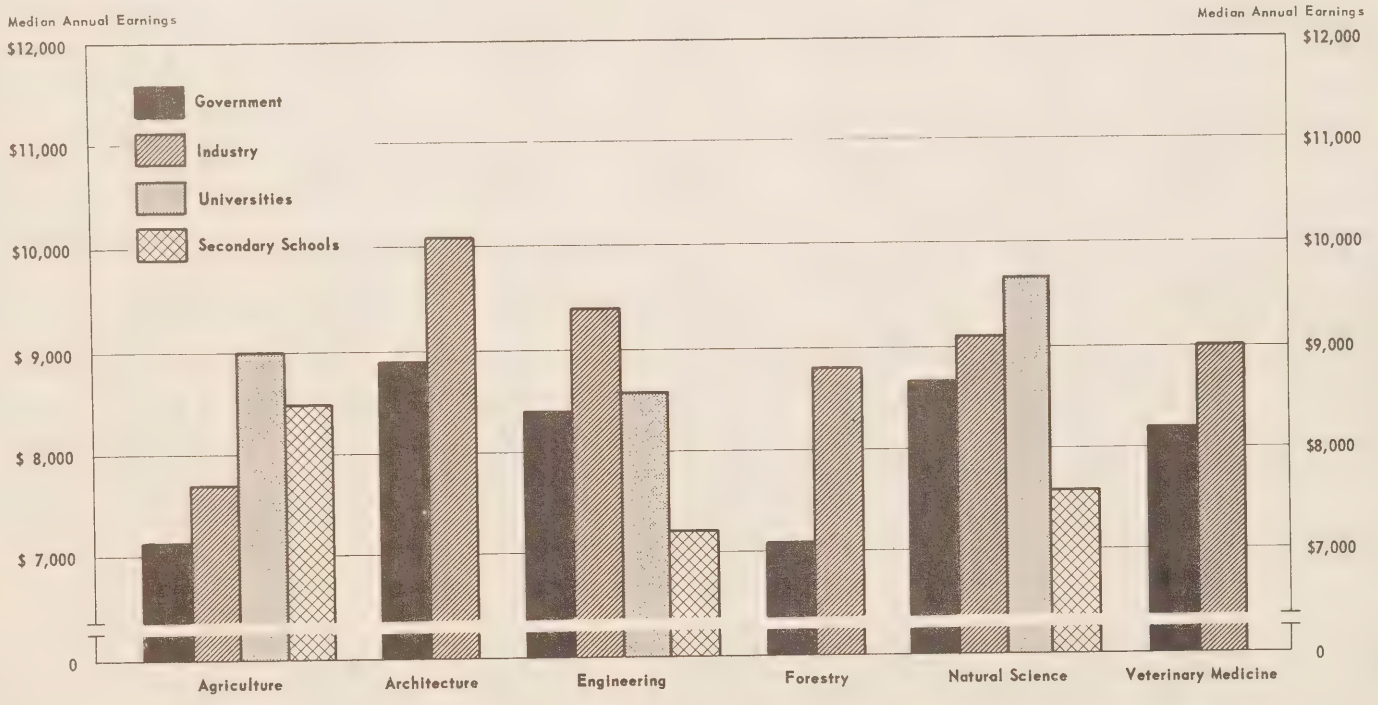
Median Annual Earnings by Employer Type, 1962
Scientific and Technical Professions

Employer Type	Agriculture		Architecture		Engineering		Forestry		Natural Science		Veterinary Medicine	
	Replies	Median	Replies	Median	Replies	Median	Replies	Median	Replies	Median	Replies	Median
	No.	$	No.	$	No.	$	No.	$	No.	$	No.	$
Government	697	7,100	52	8,900	1,688	8,400	287	7,100	798	8,700	167	8,200
Industry(1)	614	7,700	390	10,100	7,877	9,400	343	8,800	1,534	9,100	203	9,000
Universities	93	9,000	8	(2)	210	8,600	22	(2)	399	9,700	17	(2)
Secondary Schools	156	7,500	5	(2)	128	7,200	13	(2)	510	7,600	1	(2)
Not Stated	6	(2)	-	-	29	(2)	-	-	7	(2)	1	(2)
Total, All Types	1,566	7,400	455	9,900	9,932	9,200	665	7,900	3,248	8,800	389	8,500

(1) Includes private practice.
(2) Number of respondents too small to compute medians.

Chart 4

MEDIAN ANNUAL EARNINGS BY EMPLOYER TYPE,* 1962 SCIENTIFIC AND TECHNICAL PROFESSIONS



* Industry includes private practice

Table 4

Median Annual Earnings in the Scientific and Technical Professions, 1958-1962
Major Specializations

Index: 1958=100

Specialization		1958	1959	1960	1961	1962
Agriculture						
Replies	No.	1,268	1,266	1,311	1,425	1,566
Median	$	5,900	6,400	6,800	6,800	7,400
Index	%	100.0	108.5	115.3	115.3	125.4
Architecture						
Replies	No.	398	355	401	361	455
Median	$	8,800	8,800	9,200	9,500	9,900
Index	%	100.0	100.0	104.5	108.0	112.5
Engineering						
Replies	No.	7,123	8,043	9,143	9,442	9,932
Median	$	8,000	8,300	8,600	8,800	9,200
Index	%	100.0	103.8	107.5	110.0	115.0
Forestry						
Replies	No.	492	566	579	589	665
Median	$	6,700	6,900	7,300	7,600	7,900
Index	%	100.0	103.0	109.0	113.4	117.9
Natural Science						
Replies	No.	2,631	2,846	2,982	3,114	3,248
Median	$	7,300	7,700	8,100	8,400	8,800
Index	%	100.0	105.5	111.0	115.1	120.5
Veterinary Medicine						
Replies	No.	274	327	281	321	389
Median	$	7,100	7,400	7,700	8,000	8,500
Index	%	100.0	104.2	108.5	112.7	119.7
Total						
Replies	No.	12,186	13,403	14,697	15,252	16,255
Median	$	7,600	7,900	8,200	8,500	8,800
Index	%	100.0	103.9	107.9	111.8	115.8

Tableau 4

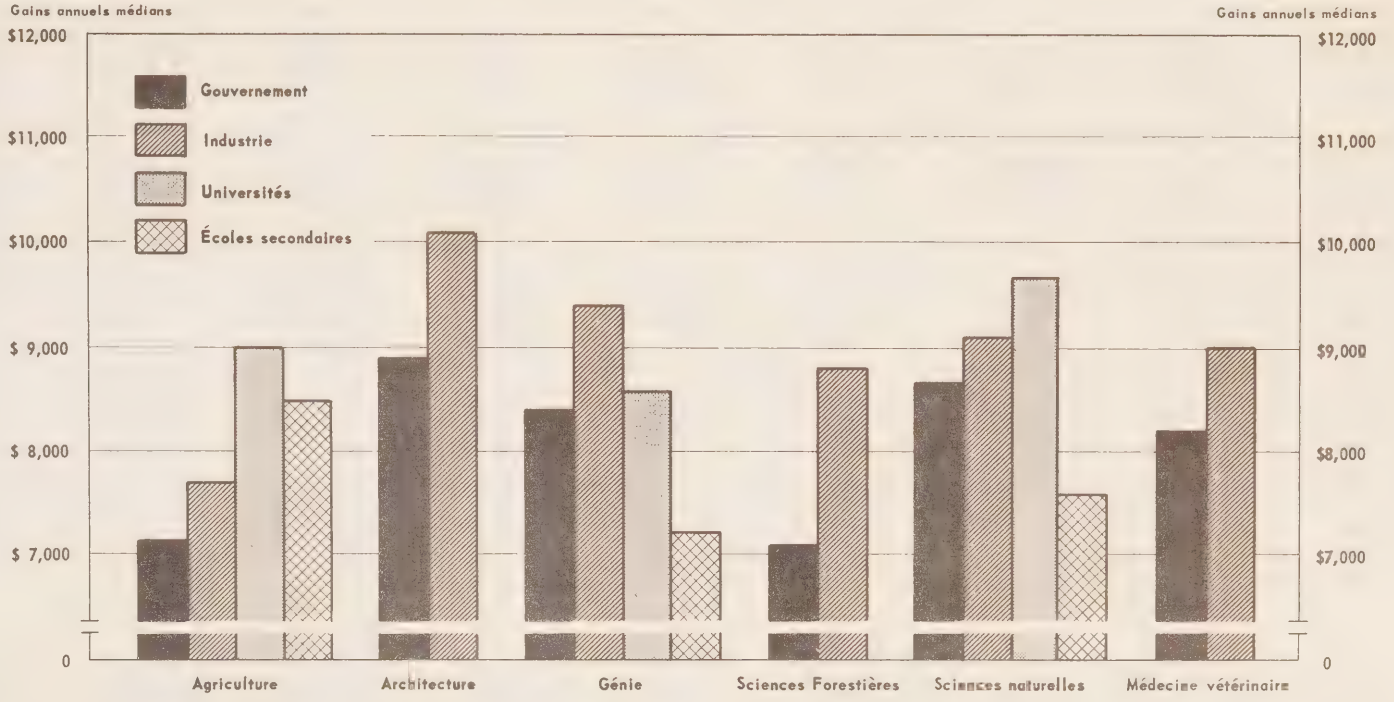
Gains Annuels Médians dans les Professions Scientifiques et Techniques, 1958-1962

Indice: 1958=100

Spécialité		1958	1959	1960	1961	1962
Agriculture						
Réponses	Nombre	1,268	1,266	1,311	1,425	1,566
Médiane	$	5,900	6,400	6,800	6,800	7,400
Indice	%	100.0	108.5	115.3	115.3	125.4
Architecture						
Réponses	Nombre	398	355	401	361	455
Médiane	$	8,800	8,800	9,200	9,500	9,900
Indice	%	100.0	100.0	104.5	108.0	112.5
Génie						
Réponses	Nombre	7,123	8,043	9,143	9,442	9,932
Médiane	$	8,000	8,300	8,600	8,800	9,200
Indice	%	100.0	103.8	107.5	110.0	115.0
Sciences Forestières						
Réponses	Nombre	492	566	579	589	665
Médiane	$	6,700	6,900	7,300	7,600	7,900
Indice	%	100.0	103.0	109.0	113.4	117.9
Sciences Naturelles						
Réponses	Nombre	2,631	2,846	2,982	3,114	3,248
Médiane	$	7,300	7,700	8,100	8,400	8,800
Indice	%	100.0	105.5	111.0	115.1	120.5
Médecine Vétérinaire						
Réponses	Nombre	274	327	281	321	389
Médiane	$	7,100	7,400	7,700	8,000	8,500
Indice	%	100.0	104.2	108.5	112.7	119.7
Total						
Réponses	Nombre	12,186	13,403	14,697	15,252	16,255
Médiane	$	7,600	7,900	8,200	8,500	8,800
Indice	%	100.0	103.9	107.9	111.8	115.8

Graphique 4

GAINS ANNUELS MÉDIANS PAR TYPES D'EMPLOYEURS,* EN 1962 PROFESSIONS SCIENTIFIQUES ET TECHNIQUES



* Y compris la pratique privée

Tableau 3

Gains Annuels Médians par Types d'Employeurs, en 1962
Professions Scientifiques et Techniques

Type d'Employeur	Agriculture		Architecture		Génie		Sciences Forestières		Sciences Naturelles		Médecine Vétérinaire	
	Réponses	Médiane	Réponses	Médiane	Réponses	Médiane	Réponses	Médiane	Réponses	Médiane	Réponses	Médiane
	Nombre	$	Nombre	$	Nombre	$	Nombre	$	Nombre	$	Nombre	$
Gouvernement	697	7,100	52	8,900	1,688	8,400	287	7,100	798	8,700	167	8,200
Industrie(1).....	614	7,700	390	10,100	7,877	9,400	343	8,800	1,534	9,100	203	9,000
Universités.....	93	9,000	8	(2)	210	8,600	22	(2)	399	9,700	17	(2)
Écoles secondaires.....	156	7,500	5	(2)	128	7,200	13	(2)	510	7,600	1	(2)
Non inclus.....	6	(2)	-	-	29	(2)	-	-	7	(2)	1	(2)
Total, tous les types	1,566	7,400	455	9,900	9,932	9,200	665	7,900	3,248	8,800	389	8,500

(1) Y compris la pratique privée.
(2) Nombre de répondants trop petit pour permettre de calculer la médiane.

Graphique 3

GAINS ANNUELS MÉDIANS PAR ANNÉES ÉCOULÉES DEPUIS L'OBTENTION DU BACCALAURÉAT, EN 1962 GÉNIE ET SCIENCES NATURELLES

Au service d'un employeur (ceux qui travaillaient à leur propre compte sont exclus)

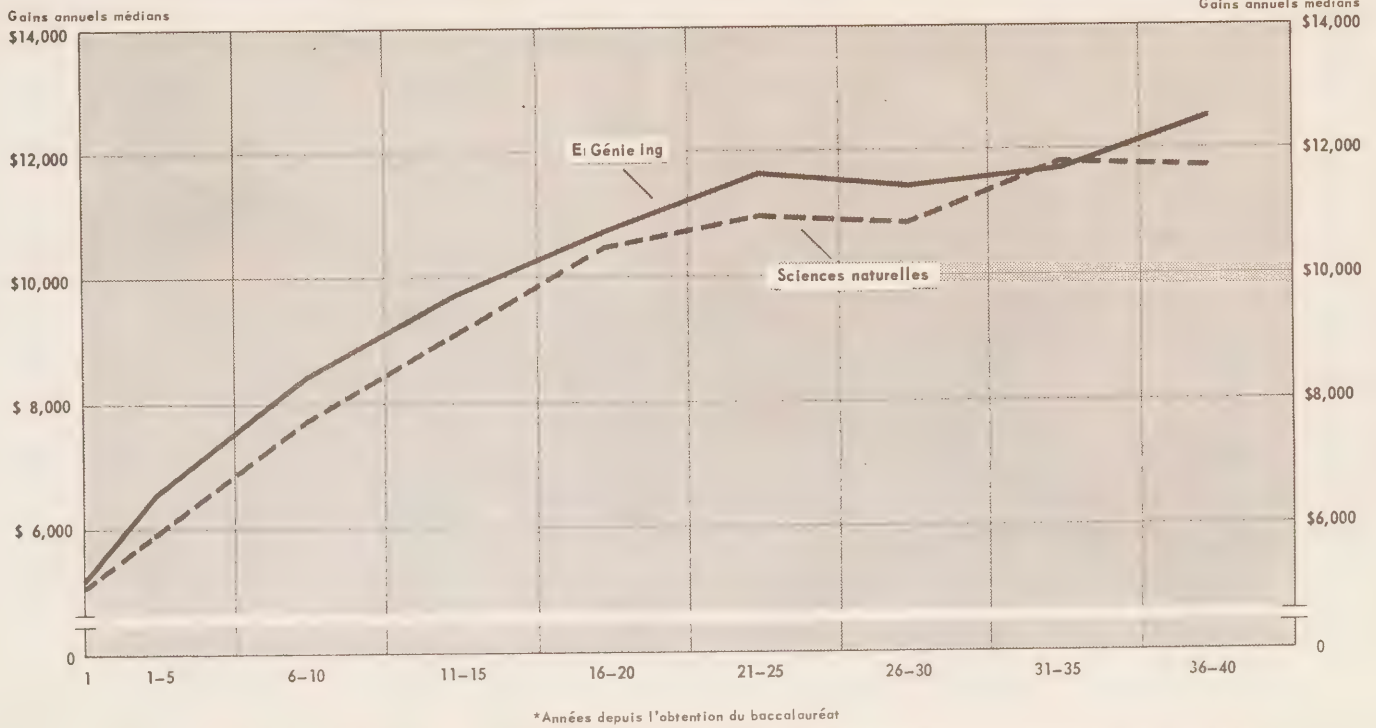


Tableau 2

Gains Annuels Médians par Années Écoulées
Depuis l'Obtention du Baccalauréat, (1) en 1962 - Génie et Sciences Naturelles

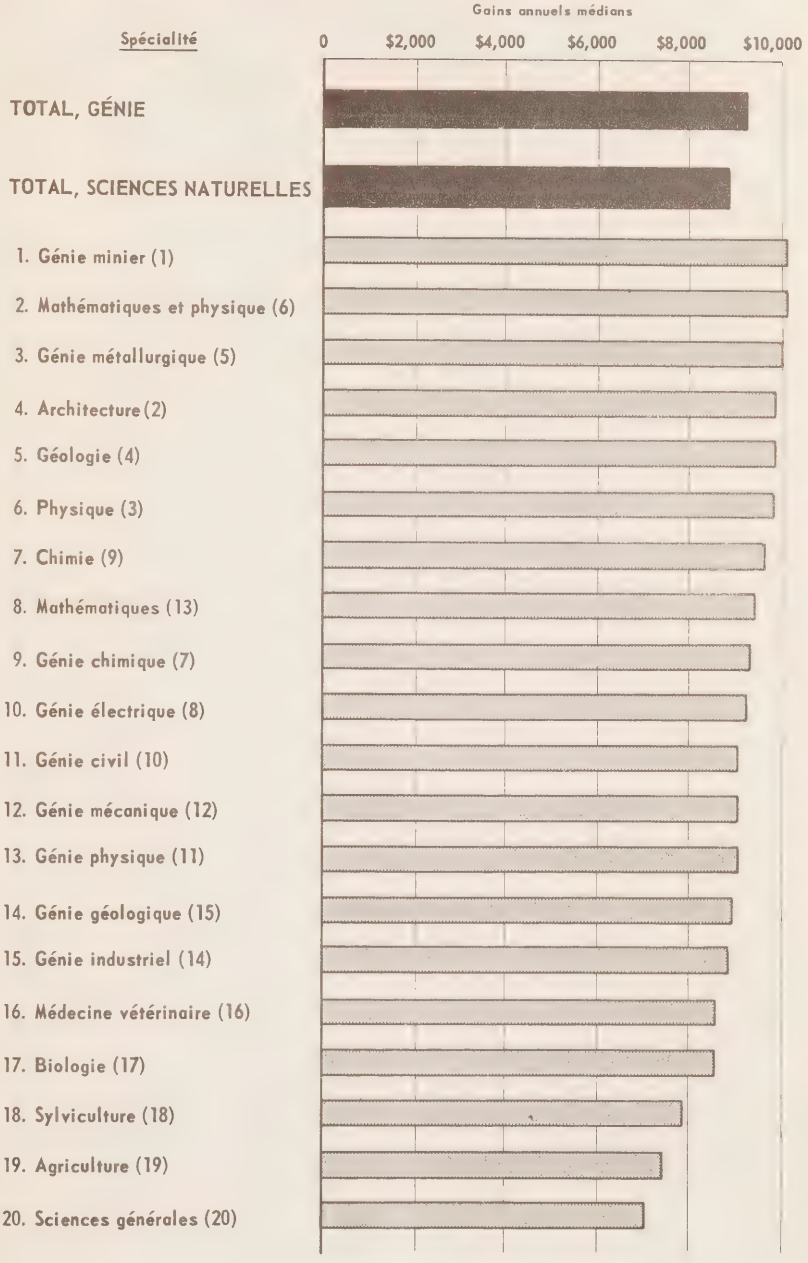
Répondants au service d'un employeur
(ceux qui travaillaient à leur propre compte sont exclus)

Années depuis l'obtention du baccalauréat	Génie		Sciences Naturelles	
	Réponses	Médiane	Réponses	Médiane
	Nombre	$	Nombre	$
0(2)	-	5,200	-	5,100
1	471	5,700	120	5,400
2	420	6,300	110	5,500
3	403	6,600	98	5,800
4	426	6,900	99	6,300
5	363	7,500	102	7,000
6	373	7,800	96	7,200
7	314	8,100	97	7,400
8	299	8,500	103	7,600
9	298	8,700	110	8,200
10	361	8,800	117	8,400
1 - 5	2,083	6,500	529	5,900
6 - 10	1,645	8,400	523	7,700
11 - 15	2,593	9,700	864	9,100
16 - 20	883	10,700	354	10,400
21 - 25	701	11,600	332	10,900
26 - 30	655	11,400	266	10,800
31 - 35	396	11,700	179	11,800
36 - 40	250	12,500	90	11,700
Plus de 40	64	(3)	19	(3)
Total, Toutes les Années	9,270	9,000	3,156	8,800

(1) L'année équivalente, dans le cas des non-diplômés.
(2) Traitement initial aux bacheliers de 1962.
(3) Nombre de répondants trop petit pour permettre de calculer la médiane.

Graphique 2

GAINS ANNUELS MÉDIANS DANS LES PROFESSIONS TECHNIQUES ET SCIENTIFIQUES, EN 1962 SELON LE RANG*



* Position en 1961 indiquée en parenthèses pour chaque spécialité

Tableau 1

Gains Annuels Médians dans les Professions Techniques et Scientifiques, 1961-1962

Spécialité[1]	1962		1961		Augmentation 1962/1961	
	Réponses	Médiane	Réponses	Médiane		
	Nombre	$	Nombre	$	$	%
Agriculture	1,566	7,400	1,425	6,800	600	8.8
Architecture	455	9,900	361	9,500	400	4.2
Génie						
Chimique	1,206	9,300	1,115	8,900	400	4.5
Civil	2,721	9,000	2,505	8,600	400	4.7
Électrique	2,176	9,200	2,120	8,900	300	3.4
Physique	186	9,000	146	8,600	400	4.7
Géologique	147	8,900	122	8,300	600	7.2
Industriel	158	8,800	142	8,400	400	4.8
Mécanique	2,221	9,000	2,214	8,600	400	4.7
Métallurgique	282	10,000	252	9,400	600	6.4
Minier	543	10,100	527	9,800	300	3.1
Autres	292	9,200	299	8,500	700	8.2
Total	9,932	9,200	9,442	8,800	400	4.5
Sciences Forestières	665	7,900	589	7,600	300	3.9
Sciences Naturelles						
Biologie	329	8,500	304	7,800	700	9.0
Chimie	893	9,600	879	8,700	900	10.3
Générales	761	7,000	568	6,600	400	6.1
Géologie	339	9,900	403	9,400	500	5.3
Mathématiques	143	9,400	156	8,500	900	10.6
Mathématiques-Physique	231	10,100	237	9,300	800	8.6
Physique	252	9,800	260	9,500	300	3.2
Autres	300	9,000	307	8,700	300	3.4
Total	3,248	8,800	3,114	8,400	400	4.8
Médecine Vétérinaire	389	8,500	321	8,000	500	6.3
Total, Toutes les Spécialités	16,255	8,800	15,252	8,500	300	3.5

(1) Les répondants sont classés par spécialités d'après le domaine d'études aux fins de leur grade universitaire le plus élevé ou le domaine d'emploi, dans le cas des non-diplômés. Pour les fins du présent rapport, "l'agriculture" et les "sciences forestières" ne sont pas comprises sous le titre "sciences naturelles".

Bulletin sur les travailleurs intellectuels

Direction de l'économique et des recherches, Ministère du Travail, Canada

NUMERO: PM/2 MAI 1963

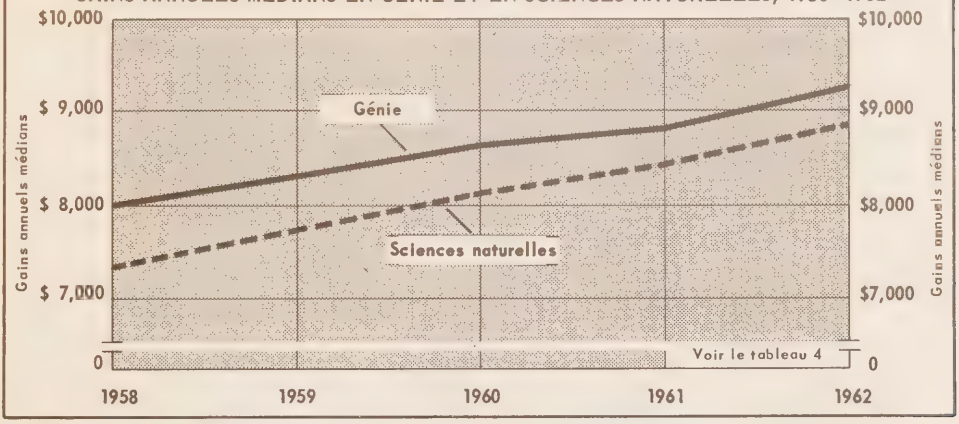
GAINS ANNUELS DANS LES PROFESSIONS SCIENTIFIQUES ET TECHNIQUES, EN 1962

Rapport préliminaire

Le ministère fédéral du Travail a mené en 1963 sa septième enquête annuelle sur les professions scientifiques et techniques, d'après un échantillon représentatif d'architectes, d'ingénieurs, d'hommes de science et de vétérinaires compétents. Les renseignements des gains annuels de ces travailleurs intellectuels, tirés des réponses de plus de 16,000 personnes, sont présentés en tableau ci-dessous. Le ministère du Travail remercie tous ceux qui ont collaboré à l'enquête.

Graphique 1

GAINS ANNUELS MÉDIANS EN GÉNIE ET EN SCIENCES NATURELLES, 1958 - 1962



PRINCIPALES CONSTATATIONS

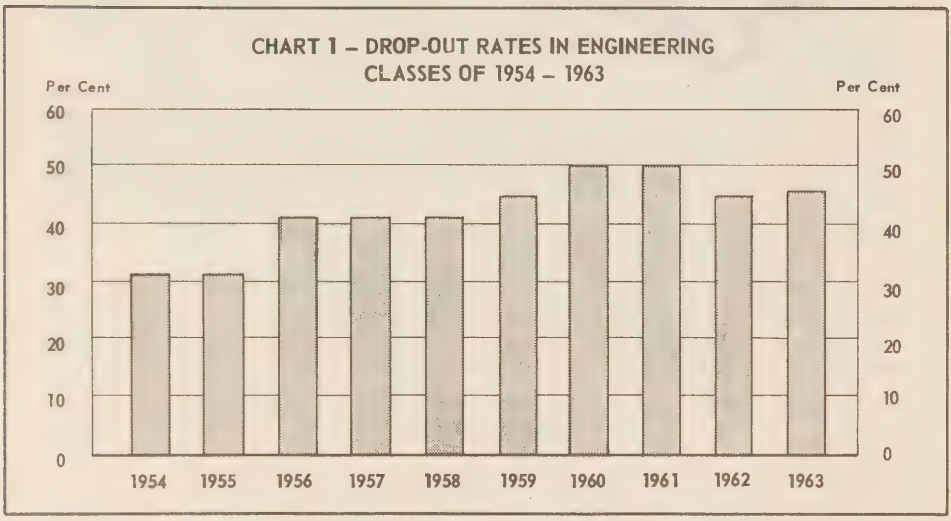
- Les gains annuels médians en 1962, dans les six principaux domaines scientifiques et techniques s'établissaient comme suit: architecture, $9,900; génie, $9,200; sciences naturelles, $8,800; médecine vétérinaire, $8,500; sciences forestières, $7,900; agriculture, $7,400.
- Les augmentations de gains annuels en 1962 ont été les plus considérables des cinq dernières années; les plus fortes ont été enregistrées dans les domaines ci-après: en mathématiques ($900); en chimie ($900); en mathématiques et physique ($800); en biologie ($700).
- De 1958 à 1962, les gains annuels médians des diplômés en agriculture ont augmenté de 25 p. 100; en sciences naturelles, de 21 p. 100; en médecine vétérinaire, de 20 p. 100 en sciences forestières, de 18 p. 100; en génie, de 15 p. 100; en architecture, de 13 p. 100.
- Dans les domaines mineurs, en 1962, les gains médians les plus élevés ont été ceux des diplômés en génie minier et en mathématiques et physique, soit $10,100, puis ceux des diplômés en métallurgie, $10,000, et en géologie, $9,900.
- Les gains en génie et en sciences en 1962 variaient entre plus de $5,000 pour les nouveau diplômés et de $10,000 à $12,000 pour ceux qui ont vingt ans ou plus d'expérience.

Professional Manpower Bulletin

Economics and Research Branch, Department of Labour, Canada

NUMBER: PM/3 OCTOBER 1963

DROP-OUT RATES IN UNIVERSITY ENGINEERING COURSES



SCOPE OF THE STUDY

The principal purpose of this study is to present statistics on drop-out rates in engineering courses in Canadian universities.(1) These rates, which reflect the proportion of students who do not complete their engineering education, cover the classes which graduated from 1954 to 1963 inclusive. For each of these classes, drop-out rates and retention rates are presented.

Drop-out rates are significant insofar as they represent a loss of potential graduates. While there is no accurate measure of student potential, it has been suggested in the Atkinson Study(2) that the performance of students in Grade XIII is the best indication of potential performance in university. To examine whether the drop-out rate in engineering constitutes a loss of potential, evidence based on the Atkinson Study is presented on the relationship between drop-outs and scholastic ability.

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(1) For an explanation of the terms, sources of data and methods used in the analysis of engineering drop-out rates see "Technical Notes" at the conclusion of the report.

Statistics necessary for the computation of drop-out rates based on full coverage are available only for engineering, and for this field, only since 1950 from the Higher Education Section, Education Division, Dominion Bureau of Statistics.

(2) W.G. Fleming, Personal and Academic Factors as Predictors of First Year Success in Ontario Universities, Atkinson Study of Utilization of Student Resources, Report No. 5 (Toronto, Ontario College of Education, Department of Educational Research, 1959) p. 4.

The causes of drop-outs are generally conceded to be multiple and complex. They have, on occasion, been the subject of discussions at Canadian conferences on education. Some of the causes suggested in the reports of these conferences are outlined in a later section.

The engineering drop-out rate, it will be seen, has varied substantially over the period. The study concludes with an examination of some academic policies and practices which may exert an influence on the drop-out rate, specifically admission requirements, academic standards and student-staff ratios.

STATISTICAL FINDINGS ON ENGINEERING DROP-OUTS

Between 1950 and 1959, engineering enrolment grew from 8,400 to 14,700. As a proportion of total university enrolment, this represented an increase from 13 per cent to 15 per cent over this period. As the numbers entering engineering increased, however, so did the proportion of them who did not complete their studies.

Out of every one hundred students who enrolled in engineering courses in Canadian universities in the period from 1950 to 1959, forty-four, on the average, dropped out of university without receiving a degree. This proportion increased from a low of 31 per cent for the class of 1954 to a high of 50 per cent for those of 1960 and 1961, falling to 46 per cent for the class of 1963.

This drop-out rate, a measure of the difference between graduations and the enrolment four years prior, expressed as a percentage of the latter, includes both failures and withdrawals. The overall drop-out rates in engineering since the class which graduated in 1954 are shown in Table 1.

Table 1 - Retention and Drop-out Rates in Engineering Classes of 1954 to 1963*

Class Of	First Year's Enrolment**	Subsequent Graduations	Retention Rate	Drop-out Rate
	No.	No.	%	%
1950-1954	1,813	1,252	69	31
1951-1955	1,949	1,337	69	31
1952-1956	2,714	1,597	59	41
1953-1957	2,960	1,741	59	41
1954-1958	3,282	1,930	59	41
1955-1959	3,712	2,047	55	45
1956-1960	4,368	2,171	50	50
1957-1961	4,831	2,412	50	50
1958-1962	4,447	2,466	55	45
1959-1963	4,098	2,200 (Est.)	54	46
Average Over Period			56	44

* Figures include enrolment and graduations in engineering courses in all universities except the University of Waterloo.

** First year of a four-year course or second year of a five-year course.

From Table 1, it can be seen that engineering graduations climbed steadily over the period, almost doubling by 1961-1962. But while the number of graduates increased, the proportion they constituted of the original first year's enrolment declined. The retention rate fell from 69 per cent for the class of 1954 to 54 per cent for that of 1963. Thus, the increase in the number of graduates was exceeded by the increase in the number of drop-outs.

The average drop-out rate in engineering in 1956-1958 appears to have been higher than that of the university as a whole. There are few statistics on which to base national averages of the latter proportion because of the variation in the degree to which universities analyze and report data on enrolments, examination failures, withdrawals and graduations. But from limited data, averaged for the years 1956-1957 and 1957-1958, the Dominion Bureau of Statistics estimated the overall university drop-out rate at about 33 per cent.(3)

Further, the engineering drop-out rate in these years was increasing while rates in several other faculties were relatively stable. Estimates of the drop-out rates in selected faculties, for the class years 1954 to 1959, are given in Table 2. It should be stressed that these estimates are based on limited data(4) and provide only a general indication of the trend within each discipline.

Table 2 - A Comparison of Drop-out Rates in Engineering With Estimated Drop-out Rates in Other Selected Faculties Graduating Years 1954 to 1959*

Class Graduating In**	Engineering	Arts & Science	Agriculture	Forestry	Commerce	Dentistry	Medicine	Law
	%	%	%	%	%	%	%	%
1954	31	37	28	24	34	10	5	22
1955	31	39	34	30	34	8	6	23
1956	41	41	27	32	36	7	6	28
1957	41	42	22	35	33	8	8	29
1958	41	42	25	24	36	8	9	29
1959	45	41	25	21	32	9	10	29

* Estimates prepared by the Department of Labour from selected data of the Higher Education Section, Education Division, Dominion Bureau of Statistics.

** Length of courses vary between faculties so starting years are not shown.

In engineering, most of the drop-out took place in the first year of the course. On the average, 24 per cent dropped out after first year, 10 per cent after second year, 6 per cent after third year and 4 per cent in their graduating year. Table 3 shows the trend in the year-to-year drop-out rates over the period. The reciprocal retention rates are shown in Table 4.

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(3) Student Progress Through the Schools by Grade, 1960. Dominion Bureau of Statistics, Queen's Printer, Ottawa, 1960, p. 41.

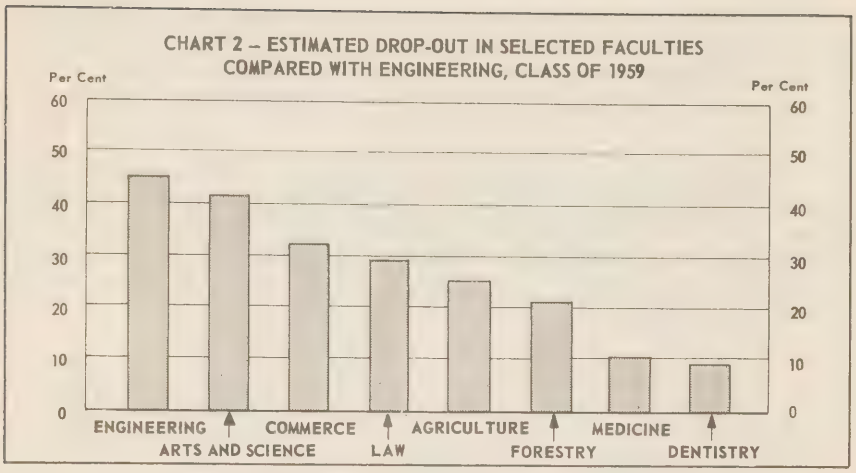
(4) For more detailed explanation, see Technical Notes.

Table 3 - Drop-out Rates in Engineering by Year of Course
Classes of 1954 to 1963

Class Of	First Year's Enrolment	Decrease in Enrolment as a Percentage of First Year's Enrolment from:				
		First to Second Year	Second to Third Year	Third to Final Year	Final Year to Graduation	First Year to Graduation
	No.	%	%	%	%	%
1950-1954	1,813	24	4	2	1	31
1951-1955	1,949	17	5	1	8	31
1952-1956	2,714	27	4	6	4	41
1953-1957	2,960	23	7	7	4	41
1954-1958	3,282	18	10	7	6	41
1955-1959	3,712	25	9	8	3	45
1956-1960	4,368	30	10	8	2	50
1957-1961	4,831	28	13	6	3	50
1958-1962	4,447	23	10	8	4	45
1959-1963	4,098	21	15	6	4	46
Average Over Period		24	10	6	4	44

Table 4 - Retention Rates in Engineering by Year of Course
Classes of 1954 to 1963

Class Of	First Year's Enrolment	Enrolment Subsequent to First Year as a Percentage of First Year's Enrolment at Beginning of:			
		Second Year	Third Year	Final Year	Graduation
	No.	%	%	%	%
1950-1954	1,813	76	72	70	69
1951-1955	1,949	83	78	77	69
1952-1956	2,714	73	69	63	59
1953-1957	2,960	77	70	63	59
1954-1958	3,282	82	72	65	59
1955-1959	3,712	75	66	58	55
1956-1960	4,368	70	60	52	50
1957-1961	4,831	72	59	53	50
1958-1962	4,447	77	67	59	55
1959-1963	4,098	79	64	58	54
Average Over Period		76	66	60	56



DROP-OUTS AND STUDENT POTENTIAL

It may be asked whether these drop-outs could properly be called "potential"; whether they had the required level of ability to succeed in university in the first place. A full answer to this question must wait upon the results of more intensive educational studies. However, the available evidence suggests that the relationship between drop-outs and low scholastic ability is not as close as might be supposed.

In the first place, not all of the drop-outs leave school as a result of failure in examinations. As mentioned earlier, drop-outs are comprised of those who withdraw for other reasons as well as those who fail. As to the extent to which drop-outs are attributable to each, the Atkinson Study of Utilization of Student Resources, from a follow-up survey of over 3,300 Ontario Grade XIII students through their first year of university in 1956-1957 discovered that 79 per cent passed their final examinations, 17 per cent failed and 4 per cent withdrew.(5) Application of this ratio to the overall average engineering drop-out rate would result in a failure rate of 35 per cent and a withdrawal rate of 9 per cent.

Moreover, the Atkinson Study showed that of those who withdrew from university 43 per cent had achieved a standing of 65 per cent or better in their Grade XIII examinations - a measure which the report considers to be the best predictor of success in university. Among the withdrawals from the first year in engineering, second class standing in Grade XIII had been held by a similar 40 per cent.

The relationship between failure in university and low scholastic ability has been the subject of studies from time to time. In a report, presented to the National Conference of Canadian Universities in 1954, drawing together the results of some studies, the following general observations were made:

> "All of the studies indicate, as is to be expected, that the average ability of those who fail in the first year is significantly below that of the year as a whole and markedly below the average of those who attain a creditable standing. This applies to both high school grades

(5) Fleming, op cit., p. 4.

and to the average obtained on tests of general ability and scholastic aptitude. An examination of the distribution of the scores on a wide variety of tests indicates that low scholastic ability is the principal contributory factor in about 40 per cent of all failures in the first year."(6)

That a significant proportion of first year failures had previously demonstrated scholastic ability is statistically supported by the results of the Atkinson Study. Table 5 shows that of the students who failed their first year in Ontario universities, 30 per cent had a standing of 65 per cent or better in Grade XIII. Second class standing was similarly held by no less than 45 per cent of the first year engineering failures.

Table 5 - Percentage of First Year University Student Enrolment, Passes, Failures and Withdrawals With Second Class Standing or Better in Grade XIII, All Disciplines and Engineering, Ontario Universities, 1956-1957*

Ontario Universities	Percentage of First Year University Students Who Had Second Class Standing or Better in Grade XIII:			
	Of Those Who Enrolled	Of Those Who Passed	Of Those Who Failed	Of Those Who Withdrew
All Disciplines	56	63	30	43
Engineering	64	77	45	40

*Fleming, op. cit., computed from Tables II, b. 5., III. b. 1, and III. b. 3.

It has been estimated by the Dominion Bureau of Statistics that, of unsuccessful candidates in university courses generally, about one in six repeat their year and eventually graduate.(7) Applying this ratio to engineering would mean that about 17 per cent of those who drop out eventually get a degree. Other engineering drop-outs, who possibly were not suited to engineering in the first place, may transfer to other faculties and ultimately graduate.

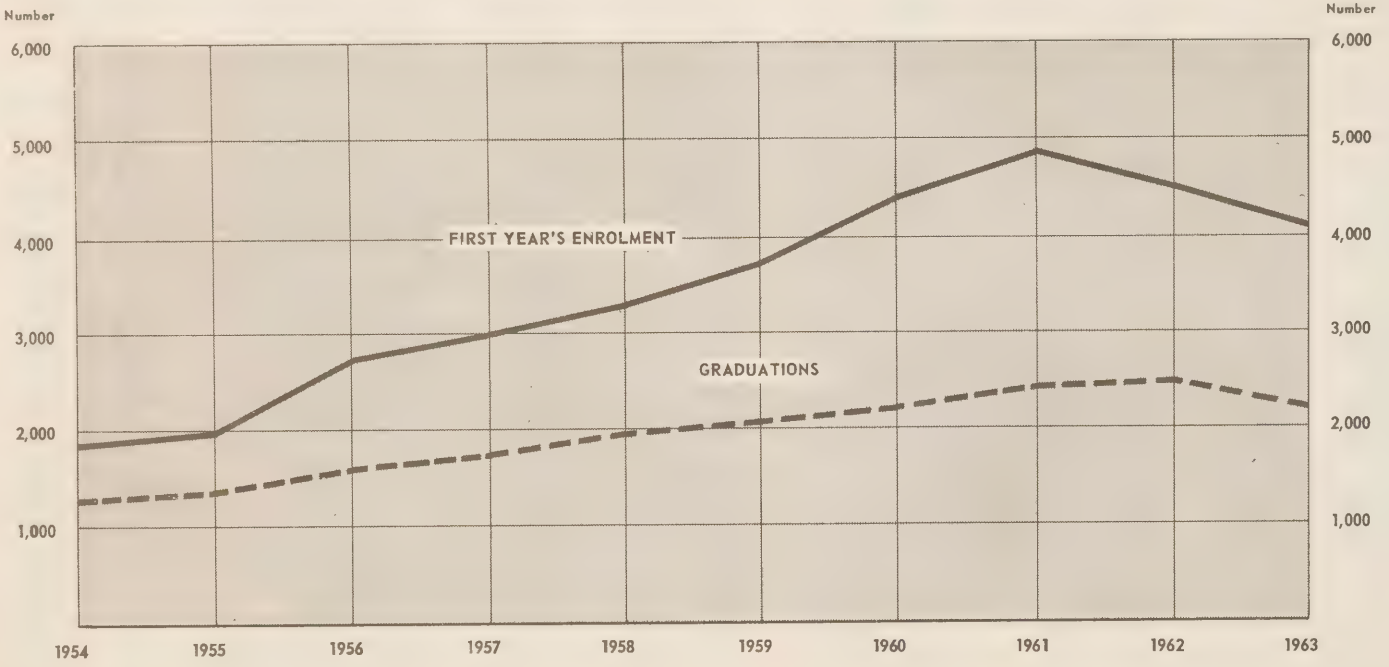
CAUSES OF DROP-OUTS

What accounts, then, for this loss of potential? What are the factors which contribute to drop-outs? The Canadian Conference on Education, in its third study report, suggests that "our failure to achieve greater development of the total student potential by formal education and training is due to many factors. Some of these operate within the personality of the individual pupil, but are generally the result of his reaction to external factors over which he has little

(6) S.N.F. Chant, "The Curtailment of Academic Waste", National Conference of Canadian Universities Proceedings, 1954 (Ottawa, NCCU, 1954), p. 28.

(7) Dominion Bureau of Statistics, Student Progress Through the Schools by Grade, Ottawa, Queen's Printer, 1960, p. 41.

CHART 3 – FIRST YEAR'S ENROLMENT AND SUBSEQUENT GRADUATIONS, ENGINEERING CLASSES OF 1954 – 1963*



*Figures do not include the University of Waterloo (Ontario) which graduated 64 engineers in 1962 and 100 in 1963.

control."[8] The report distinguishes four adverse factors which contribute to failures and withdrawals in the school system as a whole: the lack of effective guidance by parents and by society; the failure of parents and teachers to inspire motivation; the lack of opportunity provided by the curriculum; and the lack of means.

In the report to the National Conference of Canadian Universities, mentioned earlier, low scholastic ability accounted for only 40 per cent of all university failures. The remaining 60 per cent were attributed to the following contributory factors:

> "...insufficient application to studies, about 30 per cent; poor adjustment as indicated by homesickness, confusion, inattention, irregular attendance, lack of direction and so forth, about 15 per cent; personal difficulties not directly related to university such as family troubles, financial worries, boy and girl troubles, etc., about 10 per cent; and the remaining 5 per cent may be attributed to incidental factors such as addiction to bridge, too many movies, emotional disturbances, excessive outside work, too much athletic, social or dramatic participation and other personal matters. The causes for failure are usually multiple and any combination of the factors I have mentioned may bring about the failure of any particular student."[9]

INFLUENCES AFFECTING FLUCTUATIONS IN THE DROP-OUT RATE

Broadly speaking, these factors help to explain why students in general, and engineering students in particular, drop out of university. But, as has been seen, the drop-out rate in engineering has been increasing over most of the period. declining only since the class of 1962. There are a number of reasons which could account for this. To pinpoint with certainty the exact reason is beyond the scope of this study, but an examination of the more apparent influences follows.

It would be expected that an increase in the engineering drop-out rate might be related to either a relaxing of admission standards, a raising of academic standards or an increase in the student-staff ratio in engineering while the reverse could be related to a decrease in the drop-out rate.

Relaxing admission standards could raise the drop-out rate by increasing the proportion of engineering students of insufficient scholastic ability. An examination of the formal entrance requirements during the period under study, however, indicated that for the most part the requirements while far from uniform had remained unchanged until 1958. Assuming they were strictly applied, the distribution of scholastic ability would not have changed. It is possible that the minimum requirements were too low to begin with and that, with an increase in enrolment, an increasing proportion of engineering students of low ability were admitted, but, as yet, there is no evidence to either support or refute this hypothesis.

Since 1958, however, admission requirements have been raised in many universities. According to a 1963 report by the Canadian Universities Foundation

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(8) L.S. Beattie and E.F. Sheffield, Development of Student Potential, Canadian Conference on Education, Study No. 3, Ottawa, Mutual Press, 1961, p. 27.

(9) Chant, op. cit., p. 28.

"fifteen of the thirty-eight university groupings have raised the minimum standards required for admission at least once in the past five years; one of these increased requirements twice; three did so three times. The most common revision has been to set a required average where none had been specified, or to require a higher average than before."(10) Students who enrolled in engineering since 1958 graduated in the classes from 1962 on, when the drop-out rate was declining. Thus the raising of admission standards appears to correspond to a fall in the drop-out rate.

Raising academic standards could also affect the drop-out rate by increasing the number of failures. During the period under study, however, formal promotional standards apparently remained unchanged. Changes were made in engineering curricula, but they did not appear sufficient to constitute a raising of academic standards. Attainment of the prescribed academic standards depends, of course, on the extent to which examinations adequately test what the students have been taught. Assuming the examinations did this and were not accidently stiffened, they would not have influenced the drop-out rate.

The student-staff ratio is a measure of the extent of instruction and guidance at the disposal of the students. An increase in the student-staff ratio might raise the drop-out rate by inflating the proportion of students receiving less scholastic attention. Those whose academic ability was marginal, as well as those who were having personal or emotional problems could be affected. Table 6 compares the overall student-staff ratio with that in engineering during the period 1950 to 1959.

Table 6 - University Student-Staff Ratio and Engineering Student-Staff Ratio,* 1950-1951 to 1959-1960

Academic Year	Total University			Engineering		
	Full-Time Undergraduate Enrolment	Full-Time Teaching Staff	Student-Staff Ratio	Full-Time Undergraduate Enrolment	Full-Time Teaching Staff	Student-Staff Ratio
1950-1951	64,036	5,539	11.6:1	8,367	537	15.6:1
1951-1952	59,849	5,874	10.2:1	7,468	496	15.1:1
1952-1953	60,046	6,047	9.9:1	8,135	497	16.4:1
1953-1954	61,198	6,503	9.4:1	9,098	501	18.2:1
1954-1955	65,032	6,474	10.0:1	10,309	524	19.7:1
1955-1956	69,310	6,719	10.3:1	11,256	572	19.7:1
1956-1957	75,046	7,000	10.7:1	12,704	617	20.6:1
1957-1958	82,699	7,500	11.0:1	14,096	686	20.5:1
1958-1959	90,444	8,200	11.0:1	14,334	746	19.2:1
1959-1960	96,690	9,200	10.5:1	14,121	820	17.2:1

*For sources, see Technical Notes.

It can be seen that, by and large, there were more students per staff in engineering than in the university as a whole. It further appears that while the

(10) E.F. Sheffield and M. Sardinka, Admission to University, 1962 (Ottawa, Canadian Universities Foundation, 1963), p. 2.

student-staff ratio in total remained relatively stable over the period, the student-staff ratio in engineering increased significantly from 1950-1951 to 1956-1957, declining thereafter. The classes which enrolled in the former years graduated between 1954 and 1960 - the period in which the drop-out rate increased. Similarly, the classes which enrolled between 1957-1958 and 1959-1960, when the student-staff ratio fell, graduated between 1961 and 1963 when there was a decline in the drop-out rate. This correspondence between the student-staff ratio and the drop-out rate suggests that the relative supply of engineering instruction could exert an important influence on the retention of potential engineering graduates.

TECHNICAL NOTES

The engineering drop-out rates in this report are based on an analysis of engineering enrolment and graduation figures published by the Higher Education Section, Education Division, Dominion Bureau of Statistics, Ottawa. The enrolment figures refer to full-time enrolment at November 1 of each year. Graduation figures refer to academic year graduations.

In computing drop-out rates, consideration was given to the fact that engineering courses vary in length. In some universities, the period is four years; in others, five years. In the case of those universities with five-year courses, the enrolment figures reported in the second year exceeded those reported in the first year of the classes presumably due to the admission of students from high school senior matriculation and other university faculties. This means that drop-out rates taken from the first year of a five-year course would have understated the true values by excluding these later admissions. To avoid this and to facilitate uniformity, enrolment figures have been taken for the last four years prior to graduation. Thus the second year of a five-year course was considered as the first year.

The drop-out rate for each four-year course was computed by subtracting the enrolment in each year from the enrolment in the previous year and taking the difference as a percentage of the first year's enrolment. This was done for each of the ten classes which started between 1950 and 1959. The retention rate was derived by dividing the enrolment in subsequent years of a class by the first year's enrolment. This procedure, when applied to the ten classes added together, resulted in average drop-out and retention rates.

Three main limitations to these statistics should be noted. The first is that the graduation figures refer to academic year graduates which include in addition to the spring graduates of an academic year, graduates of the previous fall (e.g., Fall 1960 and Spring 1961). These fall graduates would likely not have appeared in the four previous enrolment figures of the current class, but rather in the previous class. However, a number of students of the current class graduate in the subsequent fall. Since, the proportion of fall graduates is relatively constant, this disparity is negligible.

The second limitation concerns transfers of students into the second, or later year, of an engineering course from the engineering school of another Canadian university, or from another faculty, or from another country. These would be excluded from the first year's enrolment. In the case of the former, the drop-out rates for individual universities are affected, but the overall drop-out rates take this into account. Transfers and foreign students do influence the overall rate but probably not appreciably since they appear to be few in number.

It should be noted that the data include students enrolled in the second and third years of engineering courses in universities in the Atlantic provinces who take their final two years at another university, usually Nova Scotia Technical College. These students are not, therefore, considered as transfers for the purposes of this study. Moreover, as students in the first year of five-year courses are not included in the statistics, the drop-out rates shown would be slightly understated.

Finally, the drop-out rate for a single class would, to some extent be biased by drop-outs from a previous class who have re-enrolled. Only the long-term overall average takes this into account.

The drop-out rates computed for faculties other than engineering are based on enrolment statistics published by the Dominion Bureau of Statistics available only for the period covering the classes of 1954 to 1959. Because of the differences in the reporting of enrolment figures by the universities, not all the published data could be used in the working out of these statistics. Some universities did not provide source data which were comparable over the whole of the period and therefore had to be excluded from the computations. As well, the Dominion Bureau of Statistics enrolment figures could not readily be related to graduations. Estimates for final-year drop-outs in each faculty were worked out by the Department of Labour. Consequently, as stated above, drop-out rates given in this report for disciplines other than engineering are to be taken only as estimates providing a rough guide to the trend in rates for the class years 1954 to 1959.

The student-staff ratios shown are simply a measure of the relationship of student enrolment to full-time teaching staff for a given year. They do not take into account such factors as the number of hours per week of teaching time, part-time staffs, or student work load. Included as full-time teaching staff were the following: professors, associate professors, assistant professors, and lecturers and instructors.

Sources used in the preparation of this study were:

Enrolment and graduation statistics:

Dominion Bureau of Statistics, Education Division, Higher Education Section, Survey of Higher Education, 1950-1952; 1952-1954; 1954-1961; 1962-63, Part I, Fall Enrolment in Universities and Colleges, Ottawa, Queen's Printer.

Dominion Bureau of Statistics, Education Division, Higher Education Section, Annual reports, Full-Time Undergraduate Enrolment at Canadian Universities, 1950-1958, Ottawa.

Teaching staff statistics:

Dominion Bureau of Statistics, Canada Year Book, 1952-53 to 1962, Ottawa, Queen's Printer.

The Association of Universities of the British Commonwealth, Commonwealth Universities Yearbook, 1952 to 1963, Edinburgh, R. & R. Clark Ltd.

Professional Manpower Bulletin

Economics and Research Branch, Department of Labour, Canada

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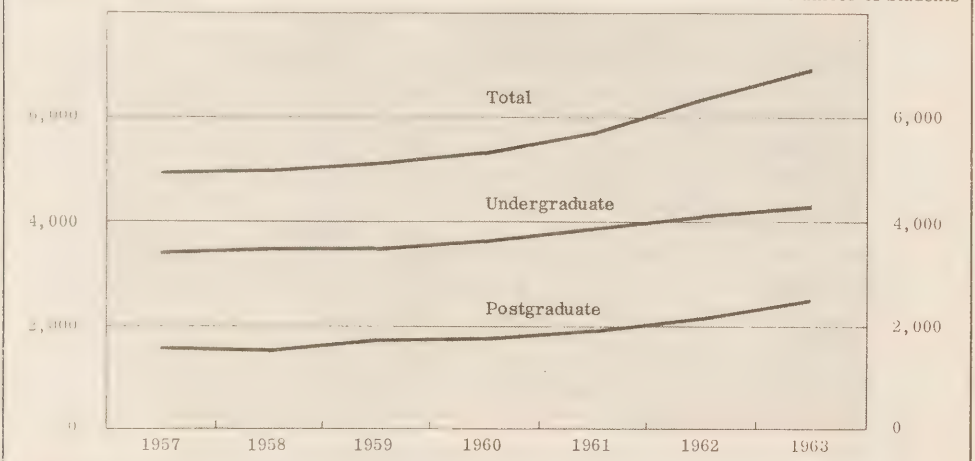
SURVEY OF CANADIANS ENROLLED AT AMERICAN UNIVERSITIES AND COLLEGES, 1962-1963

Chart 1

CANADIANS STUDYING IN THE UNITED STATES BY LEVEL OF EDUCATION, 1957-1963



Reference: Table 1.

INTRODUCTION

Each year, several thousand Canadians enroll at universities and colleges in the United States. In common with the growth in university enrolment generally, the number of these students has been increasing in recent years. While their total remains relatively small, their significance in labour market terms lies in the fact that, as highly-qualified individuals, they represent valuable potential additions to Canada's stock of professional manpower. From the point of view of education, an examination of the available statistics on these students reveals the supplementary role played by American universities in the higher education of Canadians.

This bulletin presents information on Canadian students studying at universities and colleges in the United States in the academic year 1962-63. It compares enrolment data in that year with the trend in the previous six years since 1956-57. It examines the regional distribution of these students in the United States, their sources of financial support, and their reasons for studying in the United States.

The statistics which appear in the bulletin are based on the results of two surveys. Data on the numbers and characteristics of the students are taken from the annual census of foreign students in the United States carried out by the Institute of International Education, New York, N.Y. Information on their reasons for studying in the United States was obtained in a special sample survey conducted by the Department of Labour, Canada, in 1963.

1. ENROLMENT

In 1962-63, a total of 6,858 Canadians were enrolled at universities and colleges in the United States.[1] This represented an increase of nearly 2,000 students, or forty per cent, since 1956-57. Of this total, 4,339, or sixty-three per cent were undergraduates and the remaining 2,519, or thirty-seven per cent, were postgraduates.

At each of these levels of education, enrolment had increased by about the same number (1,000) since 1956-57. But, while undergraduate enrolment rose only twenty-eight per cent over the period, postgraduate enrolment increased by sixty-three per cent, accounting in large measure for the expansion in total enrolment. This accelerated enrolment of postgraduates, however, only increased their share in the total enrolment from thirty-one per cent in 1957 to thirty-seven per cent in 1963. Since 1956-57, then, study in the United States by Canadians continued to be largely at the undergraduate level. These trends can be seen in Table 1.

Table 1

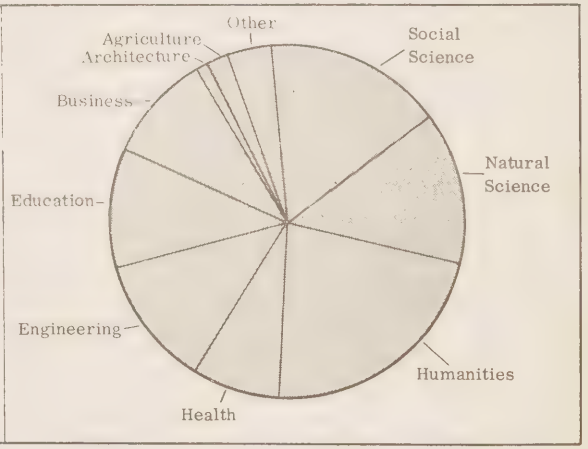
Canadians Studying in the United States by Level of Education, 1957-1963

Level of Education	Academic Year Ending In:						
	1957	1958	1959	1960	1961	1962	1963
Undergraduate ..	3,400	3,428	3,429	3,595	3,822	4,084	4,339
Postgraduate....	1,547	1,531	1,708	1,771	1,876	2,189	2,519
Total	4,947	4,959	5,137	5,366	5,698	6,273	6,858

Source: Institute of International Education, New York, N.Y.

Chart 2

DISTRIBUTION BY FIELD OF STUDY CANADIANS STUDYING IN THE UNITED STATES 1962-63



Reference: Table 2.

(1) The total of 6,858 students shown in this report does not include 139 Canadians studying in the United States who either a) did not have their matriculation and were enrolled in a course not leading to a degree, or b) did not provide information on their academic status i.e., whether they were undergraduate, postgraduate or special students. This accounts in large part for the discrepancy between the 6,858 total and the figure of 7,004 for Canadians studying in the United States in 1962-1963 published by the Institute of International Education, New York, N.Y. (Open Doors, 1963, p. 5).

In 1962-63, the largest numbers of Canadians studying in American universities were enrolled in the humanities (1,515) and the social sciences (1,086). Next came the natural sciences (971) and engineering (831) followed closely by business (722) and education (713).

Since 1956-57, the enrolment totals in these fields have been marked by varying growth rates. It can be seen in Table 2 that, between 1956-57 and 1962-63, the largest increases were in the fields of social science and education. Moderate increases in enrolment were shown in the humanities, natural science and business, while enrolment in engineering and the health sciences declined. These declines, however, were at the undergraduate level only, as postgraduate enrolment increased in all fields of study.

Table 2

Canadians Studying in the United States by Field of Study, 1957-1963

Field of Study	Academic Year Ended In:						
	1957	1958	1959	1960	1961	1962	1963
Agriculture	90	105	74	93	119	110	127
Architecture	35	43	48	33	56	58	56
Business	448	473	514	571	634	685	722
Education	356	298	376	461	507	632	713
Engineering	875	930	886	902	911	839	831
Health Sciences	581	521	562	473	451	475	568
Humanities	1,121	1,085	1,090	1,219	1,296	1,432	1,515
Natural Science	724	759	739	704	748	851	971
Social Science	572	586	654	732	781	948	1,086
Other.....	145	159	194	178	195	243	269
Total.....	4,947	4,959	5,137	5,366	5,698	6,273	6,858

Source: Institute of International Education, New York, N.Y.

Although the enrolment of Canadian students in American colleges has increased significantly since 1956-57, enrolment in Canadian universities has expanded even more, so that, by 1962-63, relatively fewer Canadians were studying in the United States. This is shown in Table 3.

Table 3

Enrolment in Canadian Universities Compared with Enrolment of Canadians in United States Universities, 1956-57 and 1962-63[1]

Level of Education	Enrolment in Canadian Universities			Enrolment of Canadians in United States Universities		
	1956-57	1962-63	Increase	1956-57	1962-63	Increase
	No.	No.	%	No.	No.	%
Undergraduate .	75,046	132,952	77	3,400	4,339	28
Postgraduate...	3,458	8,436	144	1,547	2,519	63
Total	78,504	141,388	80	4,947	6,858	39

1 Source of Canadian data: Survey of Higher Education in Canada, 1954-61; 1962-63, Part I, Dominion Bureau of Statistics, Ottawa, Queen's Printer.

2. REGIONAL DISTRIBUTION

The distribution of these students in the United States reflects both geographical and academic factors. Undergraduates tend to enroll at universities close to their homes and, consequently, a high proportion of the Canadian students were enrolled in universities in border states, with the exception of New England. The greatest concentration was in the state of Michigan, whose universities draw on neighbouring Ontario communities such as Windsor, Sarnia and Sault Ste. Marie. Postgraduates appear to be more influenced by academic considerations and Canadian registrations were heavy in the northeast, at such institutions as Columbia, Cornell, Harvard and Yale. Graduate schools in certain other areas, such as the University of Chicago and the University of Minnesota, also had sizeable Canadian registrations. The states of California and Utah were perhaps exceptions to the general rule. California universities attracted both undergraduate and postgraduate Canadian students and many Canadians study at Brigham Young University in Utah for religious reasons. Other students were to be found in all of the remaining states, including Alaska and Hawaii.

Table 4

Canadians Studying in the United States by Principal States and by Level of Education, 1962-63

State	Total	Undergraduate	Postgraduate
	No.	No.	No.
Michigan.....	1,024	865	159
New York.....	678	369	309
California.....	556	270	286
Massachusetts.....	521	200	321
Illinois	419	177	242
Washington.....	418	314	104
Utah.....	289	265	24
North Dakota.....	280	263	17
Minnesota.....	264	126	138
Montana	208	199	9
Other States.....	2,201	1,291	910
Total, All States .	6,858	4,339	2,519

Source: Institute of International Education, New York, N.Y.

Table 5 relates the students' regions of origins in Canada to their regions of study in the United States. Information for the academic year 1961-62 is used in this table, as well as in Charts 3 and 4, as this is the latest year for which this comparison can be made.

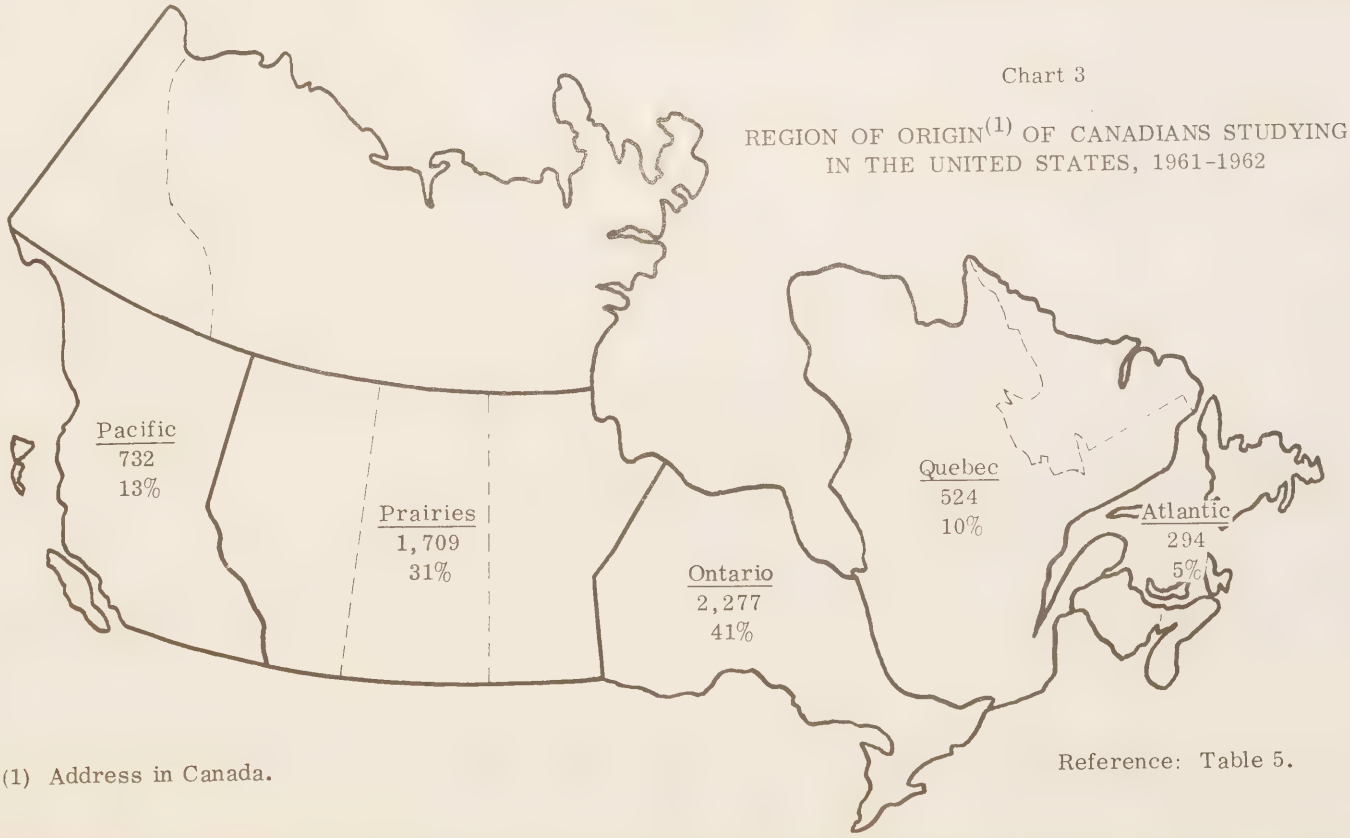
Table 5

Region of Origin in Canada by Region of Study
in the United States by Level of Education
Canadians Studying in the United States, 1961-62

Level of Education and Region of Origin in Canada	Total	Region of Study in the United States						
		North East	Great Lakes	North Central	North West	South East	South Central	South West
	No.	No.	No.	No.	No.	No.	No.	No.
Undergraduate								
Atlantic.....	169	112	27	5	-	17	5	3
Quebec	252	136	45	20	3	8	20	20
Ontario	1,599	385	873	95	29	61	88	68
Prairies.....	1,284	40	167	474	178	13	161	251
Pacific	516	26	57	37	274	7	37	78
Total.....	3,820	699	1,169	631	484	106	311	420
Postgraduate								
Atlantic.....	125	85	21	2	1	11	3	2
Quebec	272	191	46	3	6	5	12	9
Ontario	678	262	275	21	18	21	41	40
Prairies.....	425	93	147	42	49	8	31	55
Pacific	216	45	58	10	55	4	11	33
Total.....	1,716	676	547	78	129	49	98	139
Both Levels								
Atlantic.....	294	197	48	7	1	28	8	5
Quebec	524	327	91	23	9	13	32	29
Ontario	2,277	647	1,148	116	47	82	129	108
Prairies.....	1,709	133	314	516	227	21	192	306
Pacific	732	71	115	47	329	11	48	111
Total.....	5,536	1,375	1,716	709	613	155	409	559
Not Stated.....	737	213	55	108	15	11	30	217
Total.....	6,273	1,588	1,771	817	628	166	439	776

Chart 3

REGION OF ORIGIN[1] OF CANADIANS STUDYING IN THE UNITED STATES, 1961-1962

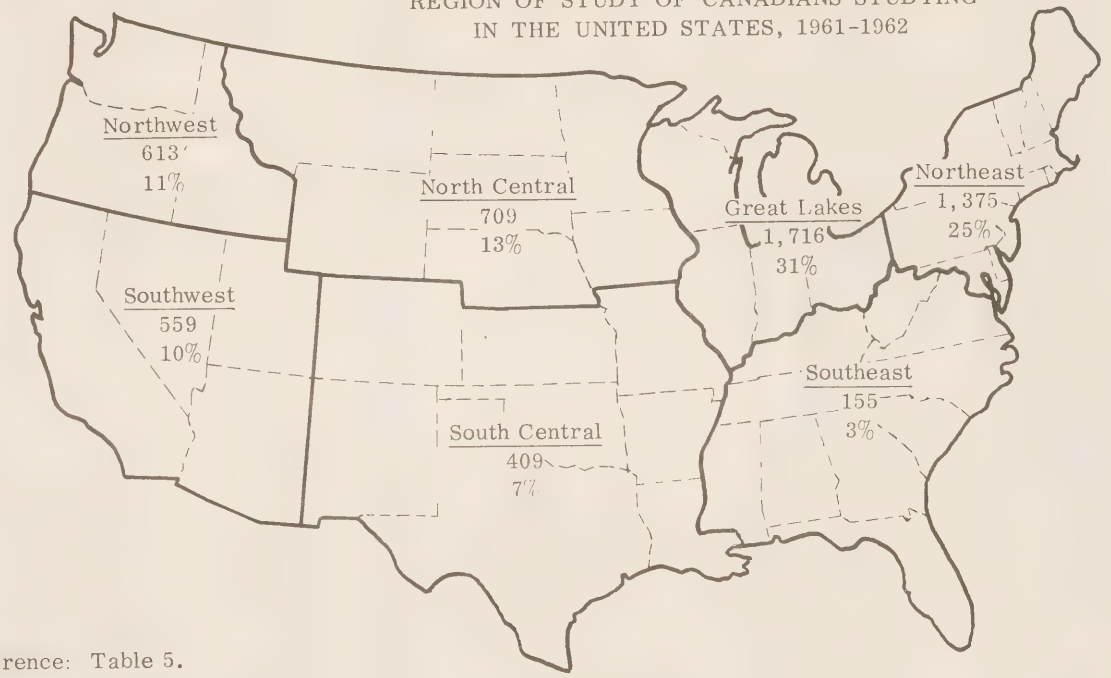


(1) Address in Canada.

Reference: Table 5.

Chart 4

REGION OF STUDY OF CANADIANS STUDYING
IN THE UNITED STATES, 1961-1962



Reference: Table 5.

3. SOURCES OF FINANCIAL SUPPORT

Table 6 shows the various sources from which Canadian students obtained financial support in 1963. It can be seen that over half of the students (55%) financed their education themselves. The remaining students relied, in varying degrees, on other sources such as, universities (21%), private organizations (11%) and governments (5%).

While undergraduates largely paid their own way, seventy per cent doing so, postgraduates relied more heavily on other sources. Over one-third of the the postgraduates (35%) obtained financial aid from the universities; another fifteen per cent depended on private organizations, while one out of every ten studied on a government grant.

Table 6

Source of Financial Support of Canadians Studying in the United States, 1962-63

Source of Financial Support[1]	Total	Undergraduate	Postgraduate
	No.	No.	No.
Self	3,767	3,051	716
University	1,460	578	882
Private Organization	767	396	371
Foreign Government[2]	268	67	201
United States Government	86	27	59
Not Stated	510	220	290
Total	6,858	4,339	2,519

Source: Institute of International Education, New York, N.Y.

1 Sources other than "Self" include combinations of sources.
2 In most cases, Canadian governments.

4. CHIEF REASONS FOR STUDYING IN THE UNITED STATES(2)

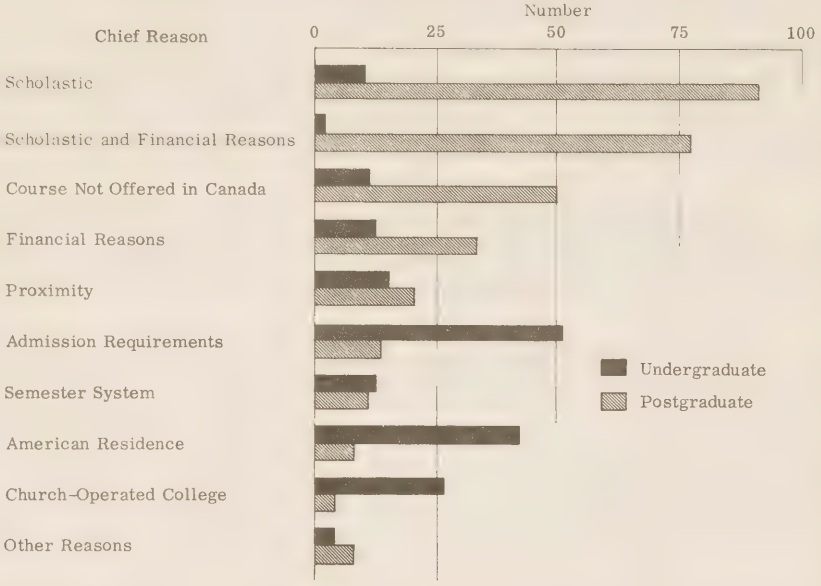
In a special survey conducted by the Department of Labour in 1963, five hundred of these students were asked to give their chief reasons for studying in the United States rather than in Canada. The replies received from undergraduates were quite different from those of the postgraduates and, accordingly, the two levels are dealt with separately in the summary of principal reasons which follows.(3)

(2) Based on a sample of 500 students, of whom 185 were undergraduates and 315 postgraduates.

(3) Most students gave more than one reason but, to facilitate classification, a principal reason was selected for each respondent. It should be kept in mind that all students are influenced to some degree by geographical considerations and that this is particularly true of the undergraduate group.

Chart 5

CHIEF REASONS FOR STUDY ABROAD BY LEVEL OF EDUCATION
CANADIANS STUDYING IN THE UNITED STATES, 1962-63



Reference: Table 7.

Undergraduates

The chief reasons given by undergraduates, in order of frequency, were:

Admission Requirements: This reason was cited largely by students who said that they were unable to qualify for entrance to Canadian universities. Some specified failure to meet the language requirements in Canada, usually French.

American Residence: There were two kinds of students in this category: those whose families were living in the United States temporarily, and those who were themselves actively seeking permanent American residence or citizenship.

Church-Operated College: This was a common reason given by adherents of a particular denomination who preferred attending a college operated by their own church, not available in Canada.

Proximity: Included here are those who said that American colleges were closest to their homes. In many cases, they added that their desired course of study could not be obtained in their home province.

Semester System: A number of students said that they preferred the American semester system, or quarter system, to the Canadian academic-year calendar. Among the advantages suggested were more flexible course arrangements, shorter but more intensive periods of study, and more frequent examinations.

Postgraduates

The above reasons, while the most common among undergraduates replying, were less frequently mentioned by postgraduates. The majority of postgraduates had quite different reasons for studying in another country, as summarized below:

Scholastic Reasons: These reasons were put forward by students who said they were attracted to the United States by better schools, curricula, faculties and facilities.

Scholastic and Financial Reasons: Next to scholastic reasons, a combination of scholastic and financial reasons were most frequently given. Most of these respondents mentioned better educational programs and more opportunities for financial assistance in the United States.

Course Not Offered In Canada; Proximity: Students citing these reasons said that courses in their special fields of interest were not offered in Canada. Others reported that the course in which they were interested was offered only in another region of Canada and that their specialty could be studied at an American university closer to home. Courses mentioned as not readily available in Canada included pharmacology, industrial pharmacy, recreation and wildlife studies, speech correction, horticulture, food chemistry, and a wide number of specialties in the fields of education, nursing and medicine.

Financial Reasons: Financial reasons were given largely by students who felt that "better financial aid" was available in the United States. Others had been awarded scholarships, assistantships, or athletic scholarships.

Other reasons cited were: the desire to study abroad, the more favourable employment opportunities, and personal reasons.

The breakdown of the sample according to these reasons is given in Table 7.

Table 7

Chief Reasons for Study Abroad, by Level of Education, Canadians Studying in the United States, 1962-63

Chief Reasons for Study Abroad	Undergraduate		Postgraduate	
	No.	%	No.	%
American Residence	42	23	8	3
Admission Requirements	51	27	13	4
Church-Operated College	26	14	4	1
Course Not Offered in Canada	11	6	50	16
Proximity	15	8	20	6
Financial Reasons	12	7	33	10
Scholastic Reasons	10	5	91	29
Scholastic and Financial Reasons	2	1	77	24
Semester System	12	7	11	4
Other Reasons	4	2	8	3
Total	185	100	315	100

Source: Economics and Research Branch, Department of Labour, Ottawa.

The following excerpts from replies received are given to illustrate some of the principal reasons these students decided to study in the United States:

"As in the case of many Ontario students who are attending or have attended American universities as undergraduates, I did not have Grade 13 standing. Wayne State University was kind enough to accept me with Grade 12."

"The quarter system allows me time to work and not lose a whole year of study."

"Because of the inconsistent education system in Canada I found myself unable to keep up with French in Manitoba after leaving an Alberta high school. Consequently, I was forced to attend college in the U.S.A."

"I decided to come down to the United States after much consideration and deliberation. However, Gonzaga was no further from my home, and it offered the opportunity to meet and live with people of a different country. Also, it was a Catholic institution, which I preferred to attend."

"Because I am a Seventh-day Adventist and am attending a private college owned by my church and also because it offers a very good Foods & Nutrition program of major study, also as a permanent resident, I can obtain a National Defence loan to aid my finances which Canada does not offer."

"Upon graduation from the Eastern Ontario Institute of Technology, Ottawa, the Canadian universities showed no interest whatsoever in my desire to obtain credit for the three years studied at E.O.I.T., consequently I went to the U.S. where I received satisfactory credit and hence was able to carry on my education. It is also easier to obtain financial assistance in the U.S. than Canada."

"The American university has provided me with a liveable income for the last three years and probably will continue to do so for the next three years. It would be difficult if not impossible to match this at a Canadian university. However, I assure you that I have absolutely no intention of remaining in the U.S.A. after completion of the Ph.D."

"For one who must finance his own way through college the larger population centers in the U.S.A. usually provide more job opportunities and at a better wage than those in Canada."

"...few Canadian universities had a Ph.D. program in Educational Psychology and those that had were not encouraging. I was encouraged to apply for admission to a Ph.D. program in each of five American universities at which I had made inquiries."

"The number and variety of courses is much greater in American universities & specialization in one area is stressed. For example, nine or ten courses are offered in Sanitary Engineering at the Master's level in Wayne State."

"1) good graduate school in geology 2) good financial aid 3) offer of financial aid arrived April 1st - 15th before Canadian offers."

"The best financial assistance I was able to obtain (NRC grant) $2,800 a year out of which I would have had to pay $1,000 a year tuition! Ford Foundation fellowship (American Funds) $5,000 a year."

"I support a wife and two children on fellowships and teaching, while continuing my studies. This is impossible in Canada. There are better research facilities and opportunities in the U.S."

"Originally we came here because my husband was accepted as a post-grad student.... Once here, we discovered that the Department of Modern Languages had a "Master of Arts in Teaching" program whereunder I could teach... and work towards the M.A.T. degree. The opportunity to "earn and learn" simultaneously was too good to miss."

"Purdue is good in Solid State Physics, it was not too hard to get in, financial support was available for a person with my academic record in Canada. Looking back, I can say that the Americans are willing to train people who will be competent but not brilliant while Canadians are still attached to the European idea that only very bright people should be educated.... Also, when one has one's degree, the opportunities for employment at higher salaries and with more prestige are better in the U.S."

"In the area of academic pediatric medical research there is more opportunity, better training facilities and about 40% better pay than Canada."

"I am specializing in Ear, Nose, & Throat which is a four-year course after an Internship. As a married man with a family, it would be impossible to live on the salaries that Canadian hospitals pay their Interns and Residents."

"Canada's emphasis on French has left a deep void in obtaining good professors and programs in the other important languages of Europe having a rich literature."

"Applied at U. of Toronto - rejected without given reason. Applied at seven universities in U.S. - accepted with stipend at all seven."

Professional Manpower Bulletin

Economics and Research Branch, Department of Labour, Canada

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AFTER-GRADUATION PLANS OF FINAL-YEAR STUDENTS IN ENGINEERING AND SCIENCE COURSES, 1958-1963

1. INTRODUCTION

This bulletin is the fifth in a series published by the Economics and Research Branch of the federal Department of Labour providing preliminary or special statements on professional manpower topics. This issue incorporates the findings of six annual surveys of after-graduation intentions of final-year students in engineering and science courses, covering the period from 1958 to 1963. The Department of Labour wishes to acknowledge the assistance of the university officials and students who co-operated in these surveys.

The statistics are based on questionnaires completed by these students, who were asked to indicate their plans for the year following graduation--whether they would be entering the labour force or continuing their studies. The surveys were carried out just prior to graduation, at which time most of the students had decided what they would be doing in the next year. Courses covered in the surveys included agriculture, architecture, engineering, forestry, honour science and veterinary medicine. However, the information provided in this bulletin is concerned mainly with the two largest of the foregoing fields, engineering and honour science.(1) Only students of Canadian citizenship were included in the tabulations. Tables 1-5 present details on after-graduation plans for these two fields and Table 6 gives a summary for all academic specializations covered in the surveys.

2. SURVEY FINDINGS

The surveys revealed a growing tendency towards postgraduate work both in engineering and in science. In 1957-58, twelve per cent of the engineering students and sixty-five per cent of those in honour science indicated that they would be continuing their studies in the following year. By 1962-63, these percentages had risen to eighteen and seventy-three respectively. In actual numbers, this represented an over-all increase from 381 to 783 students.

Between eighty and eighty-five per cent of the students who were planning further studies said they would be working towards a higher degree in an engineering or science field. If these expectations are carried out, the number of engineers and

(1) Does not include general or pass courses in science.

scientists with postgraduate degrees who might be expected from this source will have more than doubled in the six-year period and will total over 600 annually.(2)

There are, in addition, a considerable number of graduates each year who take another year or more of additional university work but not towards a higher degree in an engineering or science field. These consist almost entirely of students taking courses in business administration or commerce and those entering a professional school to study medicine, dentistry, law, theology or teaching. In engineering, a number of students each year plan to obtain a master's degree in business administration or commerce; the total for this category in 1962-63 was twenty-four. In science, on the other hand, more students enter medical schools or teachers' colleges.

Most of these students--about two-thirds of the total on the average in the period 1958-63--expected to be studying in Canada. Of those who planned to study in another country, engineering students were almost equally attracted to United States and United Kingdom universities. In science, the number of students who planned to study in the United States was significantly greater than those who intended to study in the United Kingdom. Only a very small number in each survey planned to study in other countries. It should be noted that a high proportion in each year had not decided where they would be studying at the time of the survey.

Statistics on those in the graduating class who were planning to enter the labour force immediately after graduation are given in Tables 4 and 5. On the average, about eighty per cent of the engineering group and twenty-five per cent of the science students were planning to work in the year following graduation. Among the three major types of employer--industry, government and teaching--industry was much the largest, taking about two-thirds of those in the class who had found employment at the time of the survey. The three levels of government, municipal, provincial and federal, usually employed less than one-third. It was apparent that engineering and science courses are still not a fertile recruiting ground for high school teaching. In 1962-63, the number entering the teaching profession in the year after graduation was thirty-three, and an additional seventeen said they would be entering teachers' college. Thus, the apparent total of those who would be entering the teaching profession was fifty, or about two per cent of the 2,382 in the whole class.(3)

Very few of the students who were planning to enter the labour force in the year following graduation indicated that they would be working outside Canada. In all survey years, not more than five per cent planned to work in another

(2) Statistics on postgraduate degrees awarded in Canadian universities are given in the report Survey of Higher Education of the Higher Education Section, Dominion Bureau of Statistics, Ottawa. The estimated number of postgraduate degrees awarded in the academic year 1960-61 was: engineering, 208 master's and 20 doctor's; and pure science, 398 master's and 159 doctor's, (1954-61 report, pp. 52-57). Postgraduate science students are drawn from several sources in addition to the honour science courses, including the fields of agriculture, forestry and general science; part-time students; and students who received their undergraduate education in another country. Postgraduate enrolment figures are tabulated in National Research Council report Students Registered in the Graduate Schools of Canadian Universities in Physical and Earth Sciences, Engineering and Life Sciences. The 1962-63 issue shows the total number of students registered in graduate schools in these fields was 4,952, consisting of 3,021 working towards a master's degree and 1,931 towards a doctor's degree (p. IX).

(3) It should be noted that median starting salaries in teaching in 1963 for honour science graduates at the bachelor's level, at $450 per month, were higher than comparable rates in private industry ($440) or the federal government ($430). The predominant salary range in teaching was from $425 to $500 per month.

country. Those going to the United States accounted for about one or two per cent of the total entering the labour force and the remainder were scattered among a number of other countries. Each year, there was a fairly large "undecided" group; in 1962-63 for example, these made up four per cent of the total.

Table 6 shows the after-graduation intentions of these students--further studies, entering the labour force, or other plans--by detailed course groups not only for engineering and honour science but also for other scientific fields covered, agriculture, architecture, forestry and veterinary medicine. This shows the small numbers planning postgraduate work in architecture and veterinary medicine and the high proportion planning postgraduate work in such honour science fields as biology and bacteriology.

The number of female respondents in the above six fields of study increased from 53 in 1957-58 to 112 in 1962-63. The proportion of these who said that they would be going on to graduate work nearly doubled in this period, as follows:

	1957-58		1962-63	
	No.	%	No.	%
Planning Further Studies	17	32	69	61
Entering the Labour Force	34	64	41	37
Other Plans	2	4	2	2
Total	53	100	112	100

3. SURVEY COVERAGE

Through the co-operation of the university registrars, who have assisted the Department of Labour in carrying out this program since its inception, a uniformly high rate of response was achieved in the six surveys for which information is tabulated in this bulletin. The response rate did vary from year to year, however, rising from seventy-nine per cent in 1957-58 to a high of ninety-five per cent in 1961-62 and then dropping back to eighty-six per cent. While no investigation has been made of the characteristics of those students who did not return a completed questionnaire, there is no evidence to suggest that their future intentions differed significantly from those who did reply. There were two groups in the graduating class totals shown below who were not included in the tabulations, namely general science students and citizens of other countries.

Academic Year	Graduating Class No.	Response Rate %
1957-58.....	3,917*	79
1958-59.....	4,213*	80
1959-60.....	4,303*	88
1960-61.....	4,920*	89
1961-62.....	4,042	95
1962-63.....	3,825	86

* Includes general science.

Table 1 - After-Graduation Plans by Year of Graduation
Final-Year Students in Undergraduate Engineering and Science Courses, 1958-63

Course and After-Graduation Plans	Year of Graduation											
	1958		1959		1960		1961		1962		1963	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Engineering												
Planning Further Studies	203	12	232	14	269	13	304	15	331	14	334	18
Entering the Labour Force	1,406	85	1,395	83	1,704	80	1,720	83	1,912	84	1,472	81
Other Plans(1)	45	3	44	3	141	7	45	2	38	2	21	1
Total	1,654	100	1,671	100	2,114	100	2,069	100	2,281	100	1,827	100
Honour Science(2)												
Planning Further Studies	178	65	221	71	264	63	322	71	339	65	404	73
Entering the Labour Force	91	33	84	27	106	25	116	26	164	32	145	26
Other Plans(1)	5	2	7	2	49	12	13	3	14	3	6	1
Total	274	100	312	100	419	100	451	100	517	100	555	100
Engineering and Honour Science(2)												
Planning Further Studies	381	20	453	23	533	21	626	25	670	24	738	31
Entering the Labour Force	1,497	78	1,479	75	1,810	72	1,836	73	2,076	74	1,617	68
Other Plans(1)	50	2	51	2	190	7	58	2	52	2	27	1
Total	1,928	100	1,983	100	2,533	100	2,520	100	2,798	100	2,382	100

(1) Mostly students who planned to travel abroad in the year following graduation or women students who were planning marriage and did not intend to enter the labour force or continue their studies.
(2) Does not include general or pass courses in science.

Table 2 - Intended Type of Study, Students Planning Further Studies,
Final-Year Students in Undergraduate Engineering and Science Courses, 1958-63

Intended Type of Study	Year of Graduation											
	1958		1959		1960		1961		1962		1963	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Engineering												
Business Administration and Commerce ...	19	9	35	15	11	4	22	7	20	6	24	7
Higher Degree(1)	161	79	175	76	221	82	267	88	263	79	285	85
Professional School(2)	4	2	1	-	14	5	5	1	11	3	14	4
Teachers' College	2	1	3	1	11	4	8	3	12	4	3	1
Not Stated	17	9	18	8	12	5	2	1	25	8	8	3
Total.....	203	100	232	100	269	100	304	100	331	100	334	100
Honour Science												
Business Administration and Commerce ...	2	1	3	2	-	-	-	-	1	-	4	1
Higher Degree(1)	142	80	181	82	230	87	269	83	280	83	340	84
Professional School(2)	10	6	14	6	20	7	35	11	23	7	37	9
Teachers' College	4	2	16	7	7	3	18	6	28	8	14	4
Not Stated	20	11	7	3	7	3	-	-	7	2	9	2
Total.....	178	100	221	100	264	100	322	100	339	100	404	100
Engineering and Honour Science												
Business Administration and Commerce ...	21	6	38	8	11	2	22	4	21	3	28	4
Higher Degree(1)	303	80	356	79	451	85	536	86	543	81	625	85
Professional School(2)	14	3	15	3	34	6	40	6	34	5	51	7
Teachers' College	6	1	19	4	18	3	26	4	40	6	17	2
Not Stated	37	10	25	6	19	4	2	-	32	5	17	2
Total.....	381	100	453	100	533	100	626	100	670	100	738	100

(1) Excluding master's degree in business administration and commerce.

(2) Includes a few respondents planning to take a non-technical course not leading to professional qualifications.

CHART 1 – AFTER-GRADUATION PLANS
ENGINEERING

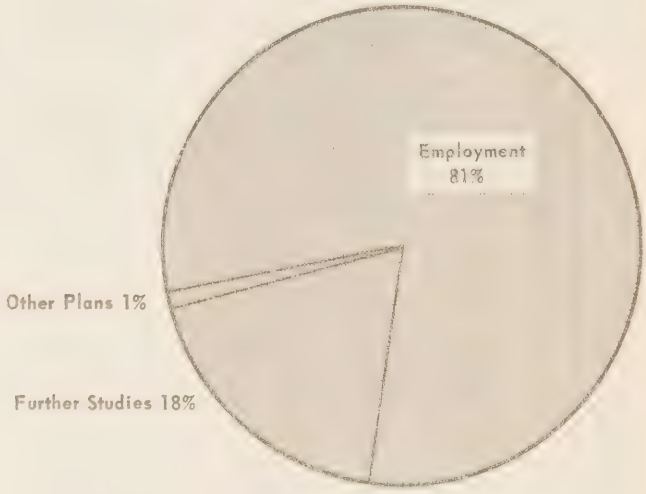

CHART 3 – INTENDED COUNTRY OF STUDY
STUDENTS PLANNING FURTHER STUDIES, 1963
ENGINEERING AND HONOUR SCIENCE

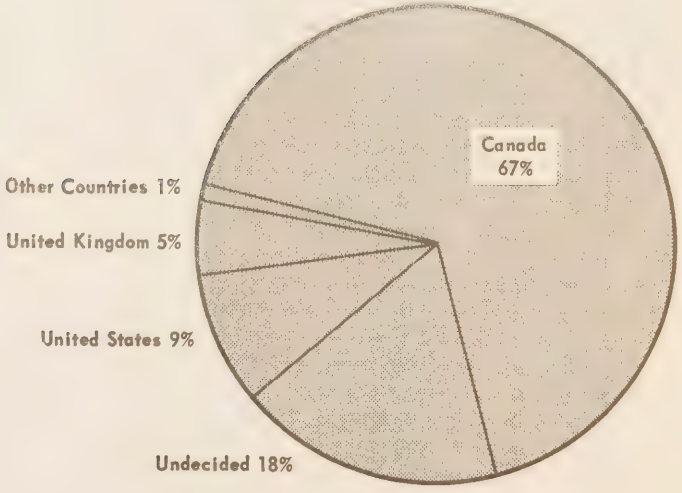

CHART 2 – AFTER-GRADUATION PLANS
HONOUR SCIENCE

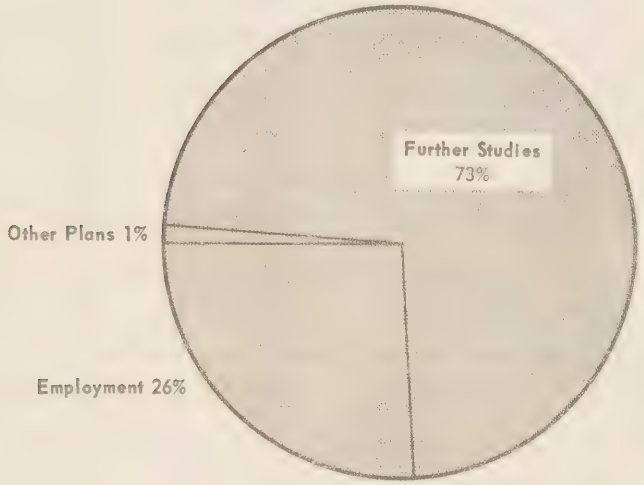

CHART 4 – INTENDED COUNTRY OF EMPLOYMENT
STUDENTS PLANNING TO ENTER THE LABOUR FORCE, 1963
ENGINEERING AND HONOUR SCIENCE

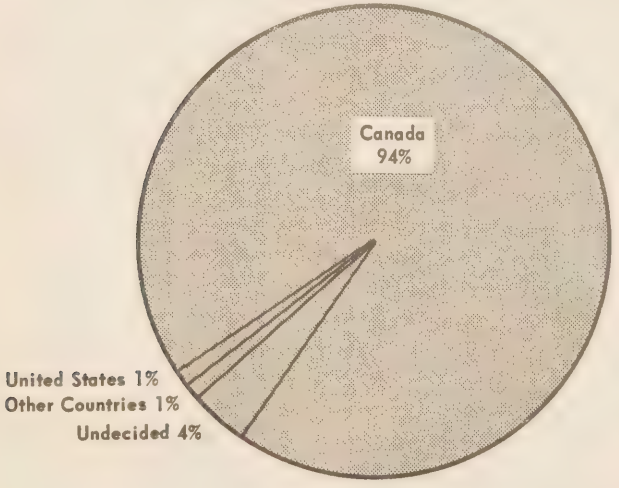

Table 3 - Intended Country of Study, Students Planning Further Studies, Final-Year Students in Undergraduate Engineering and Science Courses, 1958-63

Intended Country of Study	Year of Graduation											
	1958		1959		1960		1961		1962		1963	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Engineering												
Canada	111	55	142	61	162	60	177	58	192	58	200	60
United States	21	10	14	6	26	10	48	16	45	14	33	10
United Kingdom	21	10	25	11	19	7	23	8	28	9	33	10
Other Countries	2	1	-	-	8	3	6	2	5	1	3	1
Undecided	48	24	51	22	54	20	50	16	61	18	65	19
Total	203	100	232	100	269	100	304	100	331	100	334	100
Honour Science												
Canada	136	76	161	73	184	70	232	72	243	72	291	72
United States	12	7	24	11	19	7	32	10	34	10	35	9
United Kingdom	3	2	2	1	5	2	3	1	7	2	7	2
Other Countries	-	-	-	-	6	2	3	1	6	2	1	-
Undecided	27	15	34	15	50	19	52	16	49	14	70	17
Total	178	100	221	100	264	100	322	100	339	100	404	100
Engineering and Honour Science												
Canada	247	65	303	67	346	65	409	65	435	65	491	67
United States	33	9	38	8	45	8	80	13	79	12	68	9
United Kingdom	24	6	27	6	24	4	26	4	35	5	40	5
Other Countries	2	-	-	-	14	3	9	2	11	2	4	1
Undecided	75	20	85	19	104	20	102	16	110	16	135	18
Total	381	100	453	100	533	100	626	100	670	100	738	100

Table 4 - Type of Employer, Students Who Had Found Employment,
Final-Year Students in Undergraduate Engineering and Science Courses, 1958-63

Type of Employer	Year of Graduation											
	1958		1959		1960		1961		1962		1963	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Engineering												
Government	189	20	287	32	317	26	341	31	492	36	320	28
Industry	755	79	614	68	906	74	759	68	881	64	795	71
Teaching	8	1	6	-	4	-	16	1	7	-	11	1
Total	952	100	907	100	1,227	100	1,116	100	1,380	100	1,126	100
Honour Science												
Government	6	14	10	30	13	25	36	44	27	29	33	32
Industry	33	77	17	52	33	62	34	41	43	46	49	47
Teaching	4	9	6	18	7	13	12	15	23	25	22	21
Total	43	100	33	100	53	100	82	100	93	100	104	100
Engineering and Honour Science												
Government	195	20	297	32	330	26	377	32	519	35	353	29
Industry	788	79	631	67	939	73	793	66	924	63	844	68
Teaching	12	1	12	1	11	1	28	2	30	2	33	3
Total	995	100	940	100	1,280	100	1,198	100	1,473	100	1,230	100

Table 5 - Intended Country of Employment, Students Entering the Labour Force[1]
Final-Year Students in Undergraduate Engineering and Science Courses, 1958-63

Intended Country of Employment	Year of Graduation											
	1958		1959		1960		1961		1962		1963	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Engineering												
Canada	801	57	1,217	88	1,434	84	1,586	92	1,800	94	1,386	94
United States	9	1	5	-	18	1	21	1	25	1	19	1
Other Countries	8	-	4	-	25	2	22	2	22	1	13	1
Undecided	588	42	169	12	227	13	91	5	65	4	54	4
Total	1,406	100	1,395	100	1,704	100	1,720	100	1,912	100	1,472	100
Honour Science												
Canada	37	41	66	78	90	85	108	93	153	93	140	96
United States	-	-	-	-	2	2	2	2	5	3	3	2
Other Countries	-	-	3	4	1	1	1	1	3	2	1	1
Undecided	54	59	15	18	13	12	5	4	3	2	1	1
Total	91	100	84	100	106	100	116	100	164	100	145	100
Engineering and Honour Science												
Canada	838	56	1,283	87	1,524	84	1,694	93	1,953	94	1,526	94
United States	9	1	5	-	20	1	23	1	30	2	22	1
Other Countries	8	-	7	1	26	2	23	1	25	1	14	1
Undecided	642	43	184	12	240	13	96	5	68	3	55	4
Total	1,497	100	1,479	100	1,810	100	1,836	100	2,076	100	1,617	100

(1) These totals include students who were seeking employment. The totals in Table 4 represent the number who had found employment at the time of the survey.

Table 6 - After-Graduation Plans by Course,
Final-Year Students in Undergraduate Engineering and Science Courses, 1963

Undergraduate Course	Total		Planning Further Studies		Entering the Labour Force		Other Plans	
	No.	%	No.	%	No.	%	No.	%
Agriculture	281	100	106	38	172	61	3	1
Architecture	76	100	8	10	66	87	2	3
Engineering	1,827	100	334	18	1,472	81	21	1
Agricultural	11	100	1	9	9	82	1	9
Chemical	179	100	35	20	143	80	1	-
Civil	492	100	73	15	415	84	4	1
Electrical	450	100	71	16	377	84	2	-
Engineering Physics	135	100	76	56	58	43	1	1
Geological	40	100	13	33	24	60	3	7
Industrial	12	100	7	58	5	42	-	-
Mechanical	413	100	42	10	363	88	8	2
Metallurgical	62	100	11	18	50	81	1	1
Mining	23	100	4	17	19	83	-	-
Petroleum	4	100	1	25	3	75	-	-
Other	6	100	-	-	6	100	-	-
Forestry	77	100	16	21	60	78	1	1
Honour Science	555	100	404	73	145	26	6	1
Bacteriology	6	100	5	83	1	17	-	-
Biochemistry	38	100	28	74	9	24	1	2
Biology (incl. Zoology)	68	100	61	90	7	10	-	-
Chemistry	134	100	98	73	36	27	-	-
Geology	30	100	21	70	7	23	2	7
Mathematics	69	100	43	62	25	36	1	2
Mathematics and Physics	92	100	68	74	23	25	1	1
Physics	55	100	39	71	16	29	-	-
Other	63	100	41	65	21	33	1	2
Veterinary Medicine	56	100	4	7	52	93	-	-
Total	2,872	100	872	30	1,967	69	33	1

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Economics and Research Branch, Department of Labour, Canada

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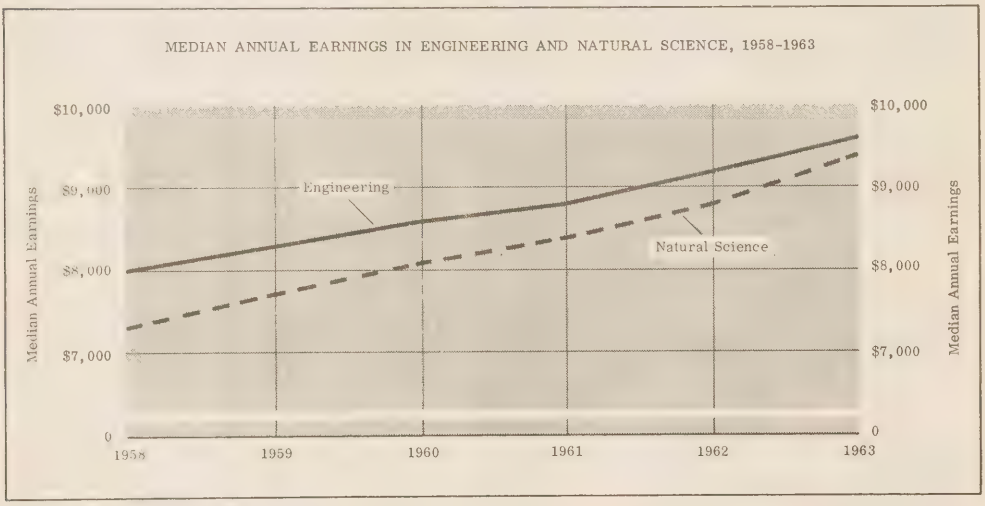
ANNUAL EARNINGS IN THE SCIENTIFIC AND TECHNICAL PROFESSIONS, 1963

A Preliminary Report

The eighth annual Survey of the Scientific and Technical Professions was carried out by the federal Department of Labour in 1964, covering a representative sample of architects, engineers, scientists and veterinarians. Information on annual earnings in these professions in 1963, tabulated from replies received from over 16,000 respondents, is given in this report. The Department of Labour wishes to acknowledge the assistance of all those who co-operated in the survey.



MAIN FINDINGS

Median annual earnings in the six major scientific and technical fields in 1963 were: agriculture, $7,600; architecture, $10,000; engineering, $9,600; forestry, $8,200; natural science, $9,400; and veterinary medicine, $8,700.

From 1958 to 1963, median annual earnings in agriculture have increased by 29 per cent; architecture, 14 per cent; engineering, 20 per cent; forestry, 22 per cent; natural science, 29 per cent and veterinary medicine, 23 per cent.

Median annual earnings in engineering and science in 1963 ranged from $5,300 for new graduates to $12,000 or more for those with twenty-five years or more experience.

The specialties in which median annual earnings were the highest were: mining engineering, $10,700; metallurgical engineering, $10,200; mathematics and physics, $10,100; and chemistry, $10,100.

Table 1

Median Annual Earnings in the Scientific and Technical Professions, 1958-1963

Earnings Index 1958=100

Specialization		1958	1960	1962	1963
Agriculture					
Replies	No.	1,268	1,311	1,566	1,430
Median Annual Earnings	$	5,900	6,800	7,400	7,600
Earnings Index	%	100	115	125	129
Architecture					
Replies	No.	398	401	455	423
Median Annual Earnings	$	8,800	9,200	9,900	10,000
Earnings Index	%	100	105	113	114
Engineering					
Replies	No.	7,123	9,143	9,932	9,953
Median Annual Earnings	$	8,000	8,600	9,200	9,600
Earnings Index	%	100	108	115	120
Forestry					
Replies	No.	492	579	665	660
Median Annual Earnings	$	6,700	7,300	7,900	8,200
Earnings Index	%	100	109	118	122
Natural Science					
Replies	No.	2,631	2,982	3,248	3,256
Median Annual Earnings	$	7,300	8,100	8,800	9,400
Earnings Index	%	100	111	121	129
Veterinary Medicine					
Replies	No.	274	281	389	365
Median Annual Earnings	$	7,100	7,700	8,500	8,700
Earnings Index	%	100	109	120	123
Total, All Specializations					
Replies	No.	12,186	14,697	16,255	16,087
Median Annual Earnings	$	7,600	8,200	8,800	9,300
Earnings Index	%	100	108	116	122

Table 2

Median Annual Earnings and Median Years
Since Bachelor Graduation, 1963

Scientific and Technical Professions

Specialization[1]	Replies	Median Annual Earnings	Median Years Since Bachelor Graduation
	No.	$	No.
Agriculture	1,430	7,600	13.3
Architecture	423	10,000	11.5
Engineering			
Chemical	1,226	9,800	12.8
Civil	2,690	9,400	11.6
Electrical	2,206	9,400	12.7
Engineering Physics	210	9,200	10.9
Geological	137	8,700	10.9
Industrial	150	9,100	8.5
Mechanical	2,233	9,600	12.4
Metallurgical	247	10,200	13.7
Mining	537	10,700	20.0
Other	317	9,500	11.7
Total, Engineering	9,953	9,600	12.4
Forestry	660	8,200	12.3
Natural Science			
Biology	398	8,700	13.8
Chemistry	832	10,100	16.8
General	524	7,700	9.5
Geology	415	10,000	13.1
Mathematics	238	9,300	12.3
Mathematics & Physics	258	10,100	16.1
Physics	267	10,000	13.8
Other	324	9,600	14.3
Total, Natural Science	3,256	9,400	13.8
Veterinary Medicine	365	8,700	13.1
Total, All Specializations	16,087	9,300	12.7

(1) Respondents were classified into specializations on the basis of field of study for their highest university degree or field of employment in the case of non-graduates. For the purposes of this report, "agriculture" and "forestry" are not included under the heading "natural science".

Table 3

Median Annual Earnings by Years Since Bachelor Graduation, 1963

Engineering and Natural Science

Years Since Bachelor Graduation[1]	Engineering		Natural Science	
	Replies	Median Annual Earnings	Replies	Median Annual Earnings
	No.	$	No.	$
0[2]	-	5,300	-	5,300
1	479	5,800	45	-[3]
2	434	6,500	103	5,600
3	375	6,700	96	6,300
4	368	7,200	116	6,500
5	413	7,600	91	7,000
6	376	8,000	96	7,400
7	356	8,400	87	7,700
8	285	8,700	88	8,200
9	330	9,200	111	8,100
10	347	9,500	118	8,700
15)		10,500	)	9,900
)			)	
20)		11,700	)	10,900
)	5,296		2,032)	
25)		12,000	)	10,700
)			)	
Over 25)		12,300	)	12,000
Not Included	894	-	273	-
Total, All Years	9,953	9,600	3,256	9,400

(1) The equivalent year was used in the case of respondents who are not university graduates.
(2) Starting salaries for 1963 bachelor's graduates.
(3) Number of replies too small to show a median.

Table 4

Decile, Quartile and Median Annual Earnings by Type of Employment and Years Since Bachelor Graduation, 1963

Engineering and Natural Science

BACHELOR'S LEVEL[1]

Type of Employment[2]	Years Since Bachelor Graduation						
	0[3]	1	3	5	10	15	20
	$	$	$	$	$	$	$
Private Industry							
1st Decile	5,100	5,100	6,000	6,300	7,600	8,100	8,500
1st Quartile	5,200	5,400	6,300	7,000	8,400	9,300	9,900
Median	5,300	5,900	6,700	7,600	9,500	10,600	11,700
3rd Quartile	5,500	6,600	7,400	8,400	10,800	12,700	15,000
9th Decile	5,800	7,200	8,300	9,300	12,800	15,700	20,200
Government							
1st Decile	5,000	5,100	5,400	6,200	6,800	7,300	7,800
1st Quartile	5,100	5,300	6,000	6,700	7,800	8,300	9,300
Median	5,200	5,600	6,400	7,300	8,700	9,300	10,400
3rd Quartile	5,300	5,900	6,800	7,800	9,600	10,500	12,200
9th Decile	5,500	7,000	7,500	8,600	10,400	11,600	14,100
All Types of Employment[4]							
1st Decile	5,100	5,100	5,500	6,300	7,300	7,900	8,300
1st Quartile	5,200	5,400	6,200	6,900	8,300	9,000	9,700
Median	5,300	5,800	6,600	7,500	9,300	10,300	11,300
3rd Quartile	5,500	6,500	7,100	8,200	10,600	12,200	14,200
9th Decile	6,200	7,100	8,100	9,000	12,400	15,200	19,300

(1) Respondents whose highest degree was a bachelor's or equivalent. Includes some professional association members who are not university graduates.

(2) The numbers of respondents were: private industry, 5,297; government, 952; and other types of employment, 573.

(3) Starting salaries for 1963 graduates.

(4) Includes those employed in universities, secondary schools, and in the armed forces as well as private industry and government.

Table 5

Decile, Quartile, and Median Annual Earnings by Type of Employment and Years Since Master's Degree, 1963

Engineering and Natural Science

MASTER'S LEVEL(1)

Type of Employment(2)	Years Since Master's Degree				
	0	5	10	15	20
	$	$	$	$	$
Private Industry					
1st Decile	5,600	6,700	8,200	8,500	8,000
1st Quartile	6,500	7,400	9,000	10,300	9,500
Median	7,700	8,400	10,500	12,200	10,900
3rd Quartile	8,700	12,300	12,700	15,600	13,800
9th Decile	9,800	19,200	15,700	23,200	16,900
Government					
1st Decile	5,300	7,100	7,300	8,000	8,700
1st Quartile	5,600	7,700	8,100	8,800	9,500
Median	6,400	8,600	9,300	9,900	10,500
3rd Quartile	7,400	9,600	10,500	11,400	12,200
9th Decile	9,700	10,200	11,700	12,900	14,100
All Types of Employment					
1st Decile	5,200	6,800	7,600	8,100	8,100
1st Quartile	5,900	7,600	8,600	9,600	9,400
Median	6,900	8,700	10,000	11,200	10,800
3rd Quartile	8,400	10,200	11,500	13,800	12,900
9th Decile	9,800	13,400	14,500	18,800	15,500

(1) Respondents whose highest degree was a master's or the equivalent.
(2) The numbers of respondents were: private industry, 452; government, 218; and other types of employment, 153.

See also the footnotes to Table 4.

Table 6

Decile, Quartile and Median Annual Earnings by Type of Employment and Years Since Ph.D., 1963

DOCTOR'S LEVEL(1)

Type of Employment(2)	Years Since Ph.D.				
	0	5	10	15	20
	$	$	$	$	$
Private Industry					
1st Decile	-(3)	8,500	9,700	11,100	10,800
1st Quartile	-	9,500	10,800	12,200	12,300
Median	-	10,500	12,600	14,000	15,100
3rd Quartile	-	12,200	14,900	19,000	19,300
9th Decile	-	12,700	17,500	26,200	29,000
Government					
1st Decile	-	7,900	8,400	8,500	9,700
1st Quartile	-	8,200	9,400	10,600	10,700
Median	-	8,700	10,500	12,300	13,600
3rd Quartile	-	9,300	11,600	14,200	15,100
9th Decile	-	11,000	13,000	15,500	16,000
All Types of Employment					
1st Decile	6,700	8,100	8,700	9,200	10,200
1st Quartile	7,500	8,600	9,900	11,200	12,000
Median	8,600	9,500	10,900	12,700	14,000
3rd Quartile	9,700	10,500	12,600	14,700	16,200
9th Decile	10,500	12,000	14,800	16,000	19,900

(1) Respondents whose highest degree was a Ph.D.

(2) The numbers of respondents were: private industry, 146; government, 198; and other types of employment 223.

(3) Number of replies too few to compute medians.

See also footnotes to Table 4.

ANNUAL SURVEY OF THE SCIENTIFIC AND TECHNICAL PROFESSIONS

Since 1957, the federal Department of Labour has been conducting annual surveys to obtain information on Canada's scientific and technical manpower resources. The mailing list for these surveys is based on the names of qualified individuals in the Scientific and Technical Personnel Register, which has been maintained by the Department of Labour since 1941. The surveys are conducted on a cyclical basis, each one covering a representative one-third sample of the total Register, and they serve the dual purpose of keeping the Register records up to date while at the same time providing statistics on the employment, earnings and education of these professionals.

There were 27,447 scientific and technical professionals on the mailing list for the 1963 survey and replies were received from 19,763 of these, or a response rate of 72 per cent. The number of questionnaires mailed out in each survey since 1958, together with the number of "replies", "no replies", and "moved", is shown below:

Year	Questionnaires							
	Mailed Out		Replies		No Replies		Returned by Post Office	
	No.	%	No.	%	No.	%	No.	%
1958	24,887	100	17,088	69	4,665	19	3,134	12
1959	22,782	100	16,991	75	4,102	18	1,689	7
1960	24,397	100	18,083	74	4,963	20	1,351	6
1961	26,205	100	20,155	77	5,294	20	756	3
1962	25,245	100	19,754	78	4,795	19	696	3
1963	27,447	100	19,763	72	6,999	26	685	2

Having been in existence for more than twenty years, the Register provides a measure of the growth of the professions which it covers, viz., agriculture, architecture, engineering, forestry, natural science and veterinary medicine. The total numbers of registrants in these fields since 1941 were as follows:

Year	Total
1941.....	24,000
1951.....	58,000
1961.....	86,000
1963.....	89,000

The principal sources of new additions to the Register are university graduations, immigration, and new members of professional associations. A fourth possible source, employees upgraded on the job to the professional level, is not included because of the difficulty of establishing objective criteria of competency. The three main categories of removals are the deceased, emigrants, and transfers to a non-technical field. Removals of these groups as a result of the 1963 survey were: deceased, 87; emigrants, 202; and transfers, 385. Two other categories on whom information is obtained through the surveys, the retired and housewives, are placed on the inactive list and not re-surveyed. There were 689 and 60 respectively in these two groups in the 1963 survey. Respondents who worked part-time or less than ten months in 1963, or who did not answer the question on earnings, are not included in the tabulations in this report. As a result of removal of these and other groups, the total number of replies remaining for tabulation purposes was 16,087.

Depuis 1957, le ministère fédéral du Travail a mené une série d'enquêtes annuelles afin d'obtenir des renseignements sur les ressources du Canada en effectifs scientifiques et techniques. Ces enquêtes ont été effectuées au moyen de listes de noms tirés du Registre du personnel scientifique et technique que le ministère maintient depuis 1941. Les enquêtes du ministère sont menées suivant un cycle, chacune portant sur un tiers des personnes inscrites au Registre. Elles ont un double but: maintenir le registre à jour et fournir des données sur l'emploi, les gains et l'instruction des professionnels en question.

La liste postale aux fins de l'enquête de 1963 comprenait les noms de 27,447 professionnels dans les rangs du personnel scientifique et technique et, de ce nombre, 19,763 ou 72 p. 100 ont répondu au questionnaire. Le nombre des questionnaires envoyés par la poste au cours de chaque enquête, de 1958 à 1963, réparti en groupes de "réponses", "sans réponses", et "déménagés" s'établissait ainsi:

Année	Questionnaires							
	Envoyés par la poste		Réponses		Sans réponses		Retournés par le bureau de poste	
	Nombre	%	Nombre	%	Nombre	%	Nombre	%
1958	24,887	100	17,088	69	4,665	19	3,134	12
1959	22,782	100	16,991	75	4,102	18	1,689	7
1960	24,397	100	18,083	74	4,963	20	1,351	6
1961	26,205	100	20,155	77	5,294	20	756	3
1962	25,245	100	19,754	78	4,795	19	696	3
1963	27,447	100	19,763	72	6,999	26	685	2

Etant donné qu'il existe depuis plus de vingt ans, le Registre fournit un aperçu de l'accroissement numérique du personnel qualifié dans les domaines spécialisés qu'il comprend: agriculture, architecture, génie, sciences forestières, sciences naturelles, médecine vétérinaire. Voici le nombre total des personnes qualifiées dans ces domaines inscrites au Registre depuis 1941:

Année	Total
1941.....	24,000
1951.....	58,000
1961.....	86,000
1963.....	89,000

Les principales sources de nouvelles inscriptions au Registre sont: les collations de grades universitaires, l'immigration et les nouvelles inscriptions aux associations professionnelles. En raison de la difficulté d'établir des critères objectifs de compétence, on n'inclut pas une quatrième catégorie possible, soit les employés promus, en cours d'emploi, au niveau professionnel. Les trois catégories principales de noms supprimés du Registre sont celles des personnes décédées, des émigrants et des personnes affectées à un emploi non technique. Pour 1963, les noms supprimés du Registre se répartissent ainsi: personnes décédées, 87; émigrants, 202; personnes affectées à un autre emploi, 385. De plus, il existe deux catégories de personnes au sujet desquelles on obtient des renseignements au moyen de l'enquête, à savoir: les personnes à la retraite et les ménagères. Ces personnes sont placées sur les listes inactives et ne font pas l'objet d'une autre enquête. A l'occasion de l'enquête de 1963, il se trouvait 689 et 60 personnes respectivement dans chacun de ces deux groupes. Les répondants ayant travaillé à temps partiel ou moins de dix mois en 1963, ou n'ayant pas répondu à la question concernant les gains, ont été retranchés avant la mise en tableaux. Par suite de la suppression de ces derniers et des membres des autres groupes en question, le total des réponses ayant servi au calcul des tableaux s'est établi à 16,087.

Tableau 6

Gains annuels déciles, quartiles et médians par types d'emploi et années écoulées depuis l'obtention du doctorat, 1963

Génie et sciences naturelles

DOCTORAT(1)

Type d'emploi(2)	Années écoulées depuis l'obtention du doctorat				
	0	5	10	15	20
	$	$	$	$	$
Industrie privée					
1er décile	-(3)	8,500	9,700	11,100	10,800
1er quartile	-	9,500	10,800	12,200	12,300
Médiane	-	10,500	12,600	14,000	15,100
3e quartile	-	12,200	14,900	19,000	19,300
9e décile	-	12,700	17,500	26,200	29,000
Gouvernement					
1er décile	-	7,900	8,400	8,500	9,700
1er quartile	-	8,200	9,400	10,600	10,700
Médiane	-	8,700	10,500	12,300	13,600
3e quartile	-	9,300	11,600	14,200	15,100
9e décile	-	11,000	13,000	15,500	16,000
Tous les types d'emploi					
1er décile	6,700	8,100	8,700	9,200	10,200
1er quartile	7,500	8,600	9,900	11,200	12,000
Médiane	8,600	9,500	10,900	12,700	14,000
3e quartile	9,700	10,500	12,600	14,700	16,200
9e décile	10,500	12,000	14,800	16,000	19,900

(1) Répondants dont le grade le plus élevé était le doctorat.
(2) Les nombres des répondants étaient: industrie privée, 146; gouvernement, 198; autres types d'emploi, 223.
(3) Nombre de réponses trop peu élevé pour permettre de calculer les médianes.

Voir aussi les notes au bas du tableau 4.

Tableau 5

Gains annuels déciles, quartiles et médians par types d'emploi et années écoulées depuis l'obtention de la maîtrise, 1963

Génie et sciences naturelles

MAITRISE(1)

Type d'emploi(2)	Années écoulées depuis l'obtention de la maîtrise				
	0	5	10	15	20
	$	$	$	$	$
Industrie privée					
1er décile	5,600	6,700	8,200	8,500	8,000
1er quartile	6,500	7,400	9,000	10,300	9,500
Médiane	7,700	8,400	10,500	12,200	10,900
3e quartile	8,700	12,300	12,700	15,600	13,800
9e décile	9,800	19,200	15,700	23,200	16,900
Gouvernement					
1er décile	5,300	7,100	7,300	8,000	8,700
1er quartile	5,600	7,700	8,100	8,800	9,500
Médiane	6,400	8,600	9,300	9,900	10,500
3e quartile	7,400	9,600	10,500	11,400	12,200
9e décile	9,700	10,200	11,700	12,900	14,100
Tous les types d'emploi					
1er décile	5,200	6,800	7,600	8,100	8,100
1er quartile	5,900	7,600	8,600	9,600	9,400
Médiane	6,900	8,700	10,000	11,200	10,800
3e quartile	8,400	10,200	11,500	13,800	12,900
9e décile	9,800	13,400	14,500	18,800	15,500

(1) Répondants dont le grade le plus élevé était la maîtrise ou son équivalent.

(2) Les nombres des répondants étaient: industrie privée, 452; gouvernement, 218; autres types d'emploi, 153.

Voir aussi les notes au bas du tableau 4.

Tableau 4

Gains annuels déciles, quartiles, et médians par types d'emploi et années écoulées depuis l'obtention du baccalauréat, 1963

Génie et sciences naturelles

BACCALAUREAT(1)

Type d'emploi(2)	Années écoulées depuis l'obtention du baccalauréat						
	0(3)	1	3	5	10	15	20
	$	$	$	$	$	$	$
Industrie privée							
1er décile	5,100	5,100	6,000	6,300	7,600	8,100	8,500
1er quartile	5,200	5,400	6,300	7,000	8,400	9,300	9,900
Médiane	5,300	5,900	6,700	7,600	9,500	10,600	11,700
3e quartile	5,500	6,600	7,400	8,400	10,800	12,700	15,000
9e décile	5,800	7,200	8,300	9,300	12,800	15,700	20,200
Gouvernement							
1er décile	5,000	5,100	5,400	6,200	6,800	7,300	7,800
1er quartile	5,100	5,300	6,000	6,700	7,800	8,300	9,300
Médiane	5,200	5,600	6,400	7,300	8,700	9,300	10,400
3e quartile	5,300	5,900	6,800	7,800	9,600	10,500	12,200
9e décile	5,500	7,000	7,500	8,600	10,400	11,600	14,100
Tous les types d'emploi(4)							
1er décile	5,100	5,100	5,500	6,300	7,300	7,900	8,300
1er quartile	5,200	5,400	6,200	6,900	8,300	9,000	9,700
Médiane	5,300	5,800	6,600	7,500	9,300	10,300	11,300
3e quartile	[illegible]	[illegible]	[illegible]	[illegible]	10,600	12,200	14,200
9e décile	[illegible]	7,100	8,100	[illegible]	12,400	15,200	19,300

(1) Répondants dont le grade le plus élevé était le baccalauréat ou son équivalent. Comprend certains membres d'associations professionnelles qui ne sont pas des diplômés d'université.

(2) Les nombres des répondants étaient: industrie privée, 5,297; gouvernement, 952; autres types d'emploi, 573.

(3) Traitement initial aux diplômés de 1963.

(4) Comprend ceux qui sont employés dans les universités, les écoles secondaires, les forces armées ainsi que dans l'industrie privée et le gouvernement.

Tableau 3

Gains annuels médians par années écoulées depuis l'obtention du baccalauréat, 1963

Génie et sciences naturelles

Années écoulées depuis l'obtention du baccalauréat[1]	Génie		Sciences naturelles	
	Réponses	Gains annuels médians	Réponses	Gains annuels médians
	Nombre	$	Nombre	$
0[2]	-	5,300	-	5,300
1	479	5,800	45	-[3]
2	434	6,500	103	5,600
3	375	6,700	96	6,300
4	368	7,200	116	6,500
5	413	7,600	91	7,000
6	376	8,000	96	7,400
7	356	8,400	87	7,700
8	285	8,700	88	8,200
9	330	9,200	111	8,100
10	347	9,500	118	8,700
15)		10,500	)	9,900
)			)	
20)		11,700	)	10,900
)	5,296		2,032)	
25)		12,000	)	10,700
)			)	
Plus de 25)		12,300	)	12,000
Non compris	894	-	273	-
Total, toutes les années	9,953	9,600	3,256	9,400

(1) L'année équivalente, dans le cas des non-diplômés.
(2) Traitement initial aux bacheliers de 1963.
(3) Nombre de répondants trop petit pour permettre de calculer la médiane.

Tableau 2

Gains annuels médians et années médianes depuis l'obtention du baccalauréat, 1963

Professions scientifiques et techniques

Spécialité (1)	Réponses	Gains annuels médians	Années médianes depuis l'obtention du baccalauréat
	Nombre	$	Nombre
Agriculture	1,430	7,600	13.3
Architecture	423	10,000	11.5
Génie			
Chimique	1,226	9,800	12.8
Civil	2,690	9,400	11.6
Electrique	2,206	9,400	12.7
Physique	210	9,200	10.9
Géologique	137	8,700	10.9
Industriel	150	9,100	8.5
Mécanique	2,233	9,600	12.4
Métallurgique	247	10,200	13.7
Minier	537	10,700	20.0
Autres	317	9,500	11.7
Total, génie	9,953	9,600	12.4
Sciences forestières	660	8,200	12.3
Sciences naturelles			
Biologie	398	8,700	13.8
Chimie	832	10,100	16.8
Générales	524	7,700	9.5
Géologie	415	10,000	13.1
Mathématiques	238	9,300	12.3
Mathématiques-physique	258	10,100	16.1
Physique	267	10,000	13.8
Autres	324	9,600	14.3
Total, sciences naturelles	3,256	9,400	13.8
Médecine vétérinaire	365	8,700	13.1
Total, toutes les spécialités	16,087	9,300	12.7

(1) Les répondants sont classés par spécialités d'après le domaine d'études aux fins de leur grade universitaire le plus élevé ou le domaine d'emploi, dans le cas des non-diplômés. Pour les fins du présent rapport, l'"agriculture" et les "sciences forestières" ne sont pas comprises sous le titre "sciences naturelles".

Tableau 1

Gains annuels médians dans les professions scientifiques et techniques, 1958-1963

Indice des gains: 1958=100

Spécialité		1958	1960	1962	1963
Agriculture					
Réponses	Nombre	1,268	1,311	1,566	1,430
Gains annuels médians	$	5,900	6,800	7,400	7,600
Indice des gains	%	100	115	125	129
Architecture					
Réponses	Nombre	398	401	455	423
Gains annuels médians	$	8,800	9,200	9,900	10,000
Indice des gains	%	100	105	113	114
Génie					
Réponses	Nombre	7,123	9,143	9,932	9,953
Gains annuels médians	$	8,000	8,600	9,200	9,600
Indice des gains	%	100	108	115	120
Sciences forestières					
Réponses	Nombre	492	579	665	660
Gains annuels médians	$	6,700	7,300	7,900	8,200
Indice des gains	%	100	109	118	122
Sciences naturelles					
Réponses	Nombre	2,631	2,982	3,248	3,256
Gains annuels médians	$	7,300	8,100	8,800	9,400
Indice des gains	%	100	111	121	129
Médecine vétérinaire					
Réponses	Nombre	274	281	389	365
Gains annuels médians	$	7,100	7,700	8,500	8,700
Indice des gains	%	100	109	120	123
Total, toutes les spécialités					
Réponses	Nombre	12,186	14,697	16,255	16,087
Gains annuels médians	$	7,600	8,200	8,800	9,300
Indice des gains	%	100	108	116	122

Bulletin sur les travailleurs intellectuels

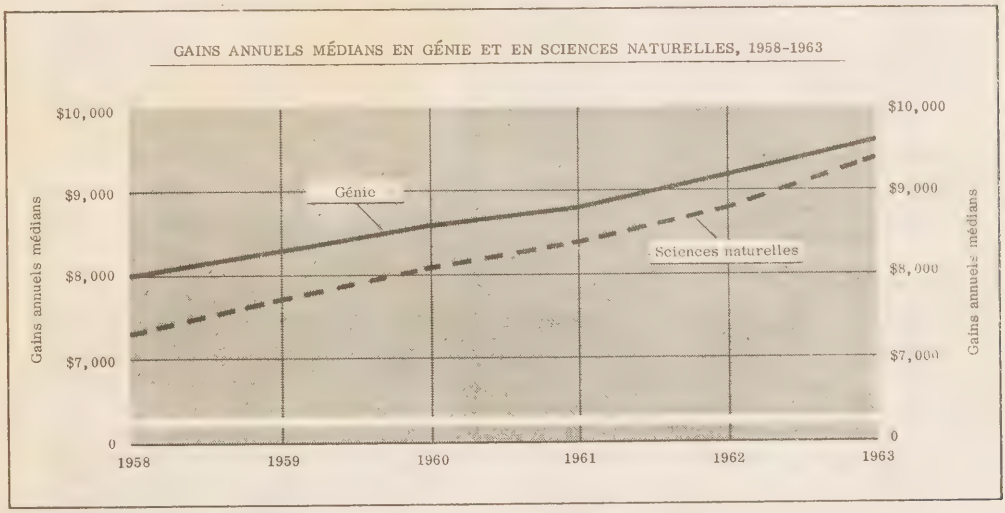
Direction de l'économique et des recherches, Ministère du Travail, Canada

NUMÉRO: PM/6 JUILLET 1964

GAINS ANNUELS DANS LES PROFESSIONS SCIENTIFIQUES ET TECHNIQUES, EN 1963

Rapport préliminaire

Le ministère fédéral du Travail a mené en 1964 sa huitième enquête annuelle sur les professions scientifiques et techniques, d'après un échantillon représentatif d'architectes, d'ingénieurs, d'hommes de science et de vétérinaires. Les renseignements sur les gains annuels de ces travailleurs intellectuels en 1963, tirés des réponses de plus de 16,000 personnes, sont presentés en tableaux ci-dessous. Le ministère du Travail remercie tous ceux qui ont collaboré à l'enquête.



PRINCIPALES CONSTATATIONS

Les gains annuels médians en 1963, dans les six principaux domaines scientifiques et techniques s'établissaient comme suit: agriculture, $7,600; architecture, $10,000; génie, $9,600; sciences forestières, $8,200; médecine vétérinaire, $8,700; sciences naturelles, $9,400.

De 1958 à 1963, les gains annuels médians des diplômés en agriculture ont augmenté de 29 p. 100; en architecture, de 14 p. 100; en génie, de 20 p. 100; en sciences forestières de, 22 p. 100; en sciences naturelles, de 29 p. 100 et en médecine vétérinaire, de 23 p. 100.

Les gains annuels médians en génie et en sciences, en 1963, variaient entre $5,300 pour les nouveaux diplômés et $12,000 et plus pour ceux qui ont vingt-cinq ans et plus d'expérience.

Les gains médians annuels les plus élevés ont été ceux des diplômés en génie minier, soit $10,700, en génie métallurgique, $10,200,en mathématiques et en physique, $10,100 et en chimie, $10,100.

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STARTING SALARIES IN ENGINEERING AND SCIENCE, 1962-1964

1. INTRODUCTION

This bulletin is the seventh in a series published by the Economics and Research Branch of the federal Department of Labour providing preliminary or special statements on professional manpower topics. This issue incorporates the salary findings from three annual surveys of final-year undergraduates in engineering and honour science courses covering the period from 1962 to 1964. The Department of Labour wishes to acknowledge the assistance of the officials and students of the Canadian universities who co-operated in these surveys.

The salary information was obtained from questionnaires completed by these students, who were asked to indicate their plans for the year following graduation - whether they had obtained employment, were seeking it or were continuing with their studies. Those who had obtained employment were asked to give their starting salaries. The surveys were carried out just prior to graduation, at which time, most of the students had decided what they would be doing in the next year.

The tables presented in this bulletin show median monthly starting salaries and predominant salary ranges for these engineering and science students from 1962 to 1964. The salary figures are examined by such variables as field of specialization, type of employer, work function and place of employment. A comparison is also made of starting salaries of these students with those of final-year students in other technical fields.

2. SURVEY FINDINGS

Between 1962 and 1964 median starting salaries in engineering and science increased from $430 to $455 a month. That this represented a general increase in starting salaries, rather than an increase influenced by a few high salaries, is indicated by the fact that the predominant salary range, which includes the middle 80 per cent of the replies, shifted from a range of $415-$465 per month to one of $440 to $500 per month.

While starting salaries in both engineering and science increased, between 1962 and 1963, from $430 to $440 a month; in 1964, starting salaries in science rose to $465, $10 a month higher than those in engineering.

Over the three-year period, starting salaries were highest in mining, geological and chemical engineering among fields of engineering, and in mathematics and mathematics and physics among science fields.

Starting salaries in engineering and science also varied by type of employer. Over the period, starting salaries in teaching exceeded those in industry, with government following close behind.

While differences in starting salaries between levels of government were only slight, those in municipal government tended to be marginally higher than those in the federal and provincial governments, but by 1964, the provincial governments had closed the gap.

Starting salaries varied little by the type of work performed, although in 1964, starting salaries in teaching ($485), production ($460) and technical sales ($460) were higher than those in other work functions.

Regional differences in starting salaries were similarly slight. Over the period, those in the Atlantic region tended to lag slightly behind those in the rest of Canada.

Where a sharp contrast in starting salaries over the period did appear it was between those in engineering and science and those in other technical fields. Starting salaries in engineering and science remained significantly above those in agriculture, architecture and forestry and were exceeded only by those in veterinary medicine.

3. SURVEY COVERAGE

The response rates to the three surveys on which the data are based were uniformly high - 95%, 85% and 87% for 1962, 1963 and 1964 respectively. Of the final-year students who responded, only students of Canadian citizenship were included in the tabulations. Of this group, those who indicated that they had obtained employment were selected for salary tabulation. The final salary tabulation included only those working in civilian employment, since starting salaries reported by those in the armed forces did not lend themselves to analysis.[1/] In general, the number of students included in the salary data covered about one third of the total number of final-year students.

The breakdown of survey coverage is shown below:

In Engineering and Honour Science Courses	1962	1963	1964
Total number of final-year students.....	3,339	3,142	3,235[2/]
Number of respondents.....	3,163	2,654	2,810[2/]
Number of Canadian respondents[3/].....	2,798	2,382	2,601
Number of employed Canadian respondents.....	1,473	1,230	1,405
Number of Canadian respondents in civilian employment providing salary data.....	1,170	1,002	1,195

All tables refer to bachelor's level

1/ Comparable monthly starting salaries in the armed forces for 1962, 1963 and 1964 were $411, $421 and $421 respectively. However, this includes basic pay and subsistence allowance for single men only and does not take into account marriage and training allowances or danger pay.

2/ Preliminary figures subject to slight revision.

3/ Excluding a few Canadians whose replies were unusable.

Table 1

Median Monthly Starting Salaries in Engineering and Science
by Field of Specialization, 1962-1964

Field of Specialization	Replies			Median Salary			Predominant Salary Range		
	1962	1963	1964	1962	1963	1964	1962	1963	1964
	No.	No.	No.	$	$	$	$	$	$
ENGINEERING									
Chemical	139	103	126	435	445	465	425 -460	435 -475	450 -480
Civil	251	193	273	430	435	450	415 -475	415 -475	430 -500
Electrical	301	273	303	425	435	450	415 -450	425 -460	440 -475
Engr Physics	63	36	41	425	450	455	415 -465	430 -465	445 -470
Geological	17	14	15	450	450	475	410 -480	440 -500[b]	450 -500
Industrial	23	4	13	435	445	465	425 -480	400[a]-480	450 -545
Mechanical	217	224	266	430	440	460	415 -455	425 -485	445 -500
Metallurgical	40	40	44	435	445	455	420 -455	440 -470	450 -475
Mining	26	13	20	450	455	480	425 -500[b]	425 -500[b]	450 -545
Other[1/]	18	15	6	425	425	445	400[a]-435	400[a]-450	440 -465
Total	1,095	915	1,107	430	440	455	415 -460	425 -475	440 -490
SCIENCE									
Biology	4	7	9	400	430	450	400[a]-430	400[a]-450	400[a]-510
Chemistry	17	18	18	430	435	460	400 -450	415 -440	420 -485
Geology	14	5	6	440	445	460	425 -500	430 -475	440 -475
Mathematics	16	19	24	435	450	480	400[a]-500	400[a]-485	410 -525
Math & Physics	13	17	15	430	450	480	400 -490	400 -500[b]	440 -510
Physics	5	8	6	430	450	450	410 -485	430 -500[b]	425 -525
Other[2/]	6	13	10	425	450	450	400[a]-500[b]	425 -500	400 -510
Total	75	87	88	430	440	465	400 -490	400 -500	410 -510
ENGINEERING AND SCIENCE									
All Fields	1,170	1,002	1,195	430	440	455	415 -465	425 -475	440 -500

1/ Includes agricultural, petroleum and surveying engineering.
2/ Includes combinations of the above fields of science.
a - under $400; b - over $500. This applies to all subsequent tables.

Table 2

Median Monthly Starting Salaries in Engineering and Science
by Type of Employer, 1962-1964

Type of Employer	Replies			Median Salary			Predominant Salary Range		
	1962	1963	1964	1962	1963	1964	1962	1963	1964
	No.	No.	No.	$	$	$	$	$	$
ENGINEERING									
Government	266	174	197	430	430	445	415 -440	415-455	420-460
Industry	824	734	902	430	440	455	415 -465	425-475	450-500
Teaching	5	7	8	430	460	490	405 -500[b]	415-500	430-550
Total	1,095	915	1,107	430	440	455	415 -460	425-475	440-490
SCIENCE									
Government	15	20	19	430	430	430	425 -480	400-450	400-450
Industry	42	48	43	430	445	465	400 -480	400-500	440-510
Teaching	18	19	26	455	450	485	400[a]-500	425-485	400-535
Total	75	87	88	430	440	465	400 -490	400-500	410-510
ENGINEERING AND SCIENCE									
Government	281	194	216	430	430	445	415 -440	415-455	420-460
Industry	866	782	945	430	440	460	415 -470	425-475	450-500
Teaching	23	26	34	450	450	485	400[a]-500[b]	425-490	400-545
Total	1,170	1,002	1,195	430	440	455	415 -465	425-475	440-500

Table 3

Median Monthly Starting Salaries in Engineering and Science in Types of Government, Industry and Teaching, 1962-1964

Type of Employer	Replies			Median Salary			Predominant Salary Range		
	1962	1963	1964	1962	1963	1964	1962	1963	1964
	No.	No.	No.	$	$	$	$	$	$
GOVERNMENT									
Federal	159	54	88	430	435	440	425 -440	415 -440	425-455
Provincial	109	130	116	425	430	450	405 -435	415 -455	415-455
Municipal	13	10	12	435	440	450	415 -460	415 -460	410-485
Total	281	194	216	430	430	445	415 -440	415 -455	420-460
INDUSTRY									
Business Service	65	47	76	425	430	450	400 -475	400 -485	425-500
Other Industry	801	735	869	430	445	460	415 -465	425 -475	450-500
Total	866	782	945	430	440	460	415 -470	425 -475	450-500
TEACHING									
University	7	4	9	460	420	500	400[a]-500[b]	400[a]-425	425-600[b]
Secondary School	16	22	25	445	455	480	400 -500	440 -500	400-500
Total	23	26	34	450	450	485	400[a]-500[b]	425 -490	400-545
ALL EMPLOYERS									
Total	1,170	1,002	1,195	430	440	455	415 -465	425 -475	440-500

Table 4

Median Monthly Starting Salaries in Engineering and Science by Work Function, 1962-1964

Work Function	Replies			Median Salary			Predominant Salary Range		
	1962	1963	1964	1962	1963	1964	1962	1963	1964
	No.	No.	No.	$	$	$	$	$	$
ENGINEERING									
Administration	51	49	54	430	435	450	400[a]-455	400[a]-470	440 -500
Construction	167	98	130	430	430	450	410 -475	415 -475	420 -500
Design	244	233	275	430	440	450	415 -450	425 -475	440 -480
Private Practice	21	15	25	425	430	455	400 -475	420 -450	400[a]-500
Production	403	353	472	430	440	460	415 -475	430 -475	445 -500
Research	124	61	85	430	445	455	415 -475	425 -480	440 -475
Teaching	7	9	8	425	460	485	405 -500[b]	450 -495	430 -550
Technical Sales	67	56	55	425	450	460	425 -450	430 -460	450 -470
Other	11	41	3	430	430	450	415 -485	425 -450	400[a]-450
Total	1,095	915	1,107	430	440	455	415 -460	425 -475	440 -490
SCIENCE									
Administration	12	17	13	440	440	490	400 -490	400[a]-500	435 -525
Construction	-	-	-	-	-	-	-	-	-
Design	-	1	1	-	-	-	-	-	-
Private Practice	1	3	4	-	-	-	-	-	-
Production	12	15	16	430	440	450	400 -465	420 -485	430 -480
Research	27	25	29	430	430	450	400 -450	400 -460	400 -475
Teaching	19	21	25	450	450	485	400 -500	425 -485	420 -535
Technical Sales	3	3	-	-	-	-	-	-	-
Other	1	2	-	-	-	-	-	-	-
Total	75	87	88	430	440	465	400 -490	400 -500	410 -510
ENGINEERING AND SCIENCE									
Aministration	63	66	67	430	435	450	400[a]-480	400[a]-475	440 -500
Construction	167	98	130	430	430	450	410 -475	415 -475	420 -500
Design	244	234	276	430	440	450	415 -450	425 -475	440 -480
Private Practice	22	18	29	425	430	450	400 -475	420 -500	400[a]-500
Production	415	368	488	430	440	460	415 -460	425 -485	445 -500
Research	151	86	114	430	440	455	415 -475	425 -470	435 -475
Teaching	26	30	33	440	450	485	400 -500	425 -495	420 -540
Technical Sales	70	59	55	425	450	460	425 -450	430 -465	450 -470
Other	12	43	3	430	430	450	415 -485	425 -450	400[a]-460
Total	1,170	1,002	1,195	430	440	455	415 -465	425 -475	440 -500

Table 5

Median Monthly Starting Salaries in Engineering and Science
by Place of Employment, 1962-1964

Place of Employment	Replies			Median Salary			Predominant Salary Range		
	1962	1963	1964	1962	1963	1964	1962	1963	1964
	No.	No.	No.	$	$	$	$	$	$
ENGINEERING									
Atlantic	52	47	66	425	430	450	400 -500[b]	410 -480	435 -545
Quebec	355	359	352	425	440	455	415 -500	425 -475	440 -500
Ontario	451	440	454	430	440	455	415 -450	425 -475	440 -475
Western	237	160	235	430	445	455	415 -460	425 -475	440 -500
Total	1,095	915	1,107	430	440	455	415 -460	425 -475	440 -490
SCIENCE									
Atlantic	2	2	3	415	425	420	400[a]-430	400[a]-450	400[a]-450
Quebec	13	16	27	460	435	470	400 -500	400 -500[b]	440 -535
Ontario	43	57	51	430	440	465	400 -480	415 -485	400 -500
Western	17	12	7	430	445	465	400 -500	410 -485	410 -495
Total	75	87	88	430	440	465	400 -490	400 -500	410 -510
ENGINEERING AND SCIENCE									
Atlantic	54	49	69	425	430	450	400 -500[b]	405 -480	420 -545
Quebec	368	375	379	425	440	455	415 -500	425 -475	440 -500
Ontario	494	406	505	430	440	455	415 -450	425 -475	440 -480
Western	254	172	242	430	445	455	415 -465	425 -475	440 -500
Total	1,170	1,002	1,195	430	440	455	415 -465	425 -475	440 -500

Table 6

Median Monthly Starting Salaries in Engineering and Science Compared to Selected Technical Fields, 1962-1964

Field	Replies			Median Salary			Predominant Salary Range		
	1962	1963	1964	1962	1963	1964	1962	1963	1964
	No.	No.	No.	$	$	$	$	$	$
Engineering	1,095	915	1,107	430	440	455	415 -460	425 -475	440-490
Science	75	87	88	430	440	465	400 -490	400 -500	410-510
Total	1,170	1,002	1,195	430	440	455	415 -465	425 -475	440-500
Agriculture	100	102	126	400	410	425	400[a]-445	400[a]-450	400-480
Architecture	10	10	14	400	440	455	400 -440	400 -480	400-580
Forestry	30	24	32	400	425	440	400[a]-425	400[a]-500[b]	400-475
Veterinary Medicine	15	19	17	500	525	550	400 -500[b]	500 -600[b]	500-600[b]
GRAND TOTAL	1,325	1,157	1,384	430	440	455	400 -465	410 -480	425-500

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